AN ARGUS SPECIALIST PUBLICATION

A&B COMPUTING

March 1988
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14 VAL

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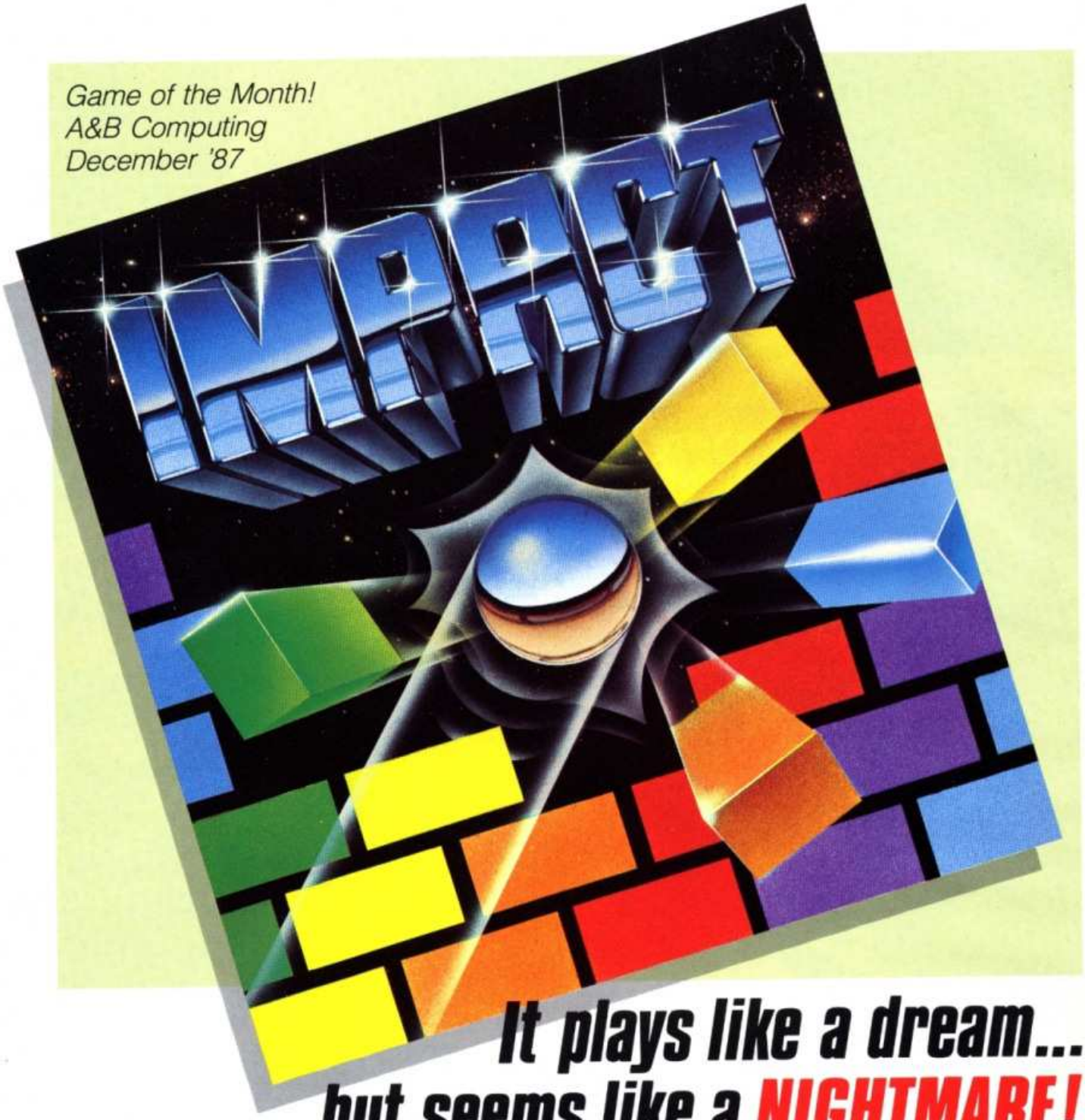
WINCHESTER DISCS – THE WATFORD WAY

SCREEN MASTER
Video effects studio for your BBC

LEARNING WITH THE BBC MICRO
Historical simulations

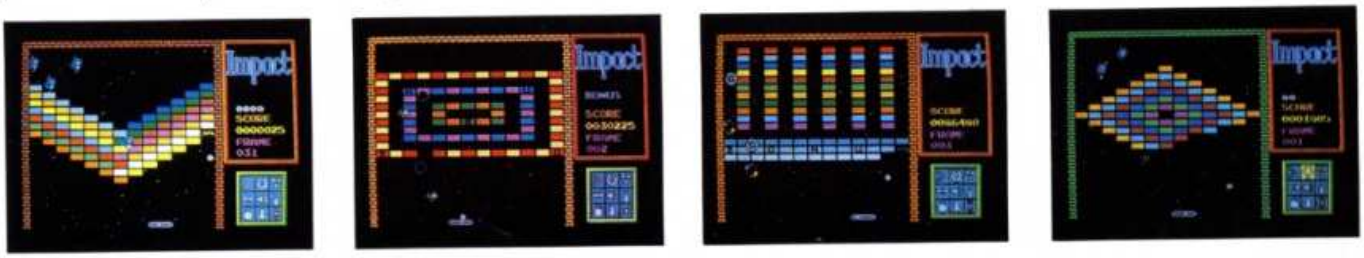
Archimedes
ISO Pascal
Programmer's Reference Manual
System Delta Plus

Game of the Month!
A&B Computing
December '87



It plays like a dream... but seems like a NIGHTMARE!

TRAPPED – in a 1970's arcade machine! Every escape route is blocked by a wall of brightly coloured bricks. Powerfully addictive, with 200k of digitized sound, **IMPACT** has 80 built in screens plus 48 that you can design yourself – as hard, as simple, as much fun as you like. Hidden on each screen are special tokens – catch them if you can. Use them to buy one of nine powerful weapons, or keep them until the end of the screen to score a bonus.



Available now, price £14.95 for Amiga (512k min.) and Atari ST (requires 512k, mouse and colour monitor or TV).
BBC/Electron: Tape £9.95, BBC Disk £12.95 (specifications vary).
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£30 5¼ inch Disc (ADFS ONLY) **£34** 3½ inch Disc

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The ARTROOM pack consists of ARTROOM and ACE (Artroom Colour Extension). ARTROOM is an icon based full screen graphics package which can be controlled by mouse or keyboard. All the usual features are there including 'cut and paste' and our highly acclaimed ZOOM option plus an extensive graphics library to help you produce pictures quickly. An advanced printer dump is also supplied.

'ARTROOM...the best there is.'— Acorn User Feb '87

'ARTROOM is the software for you.' A & B Jan '87

ACE consists of two programs. COLOURIZER enables you to produce MODE 1 colour versions of ARTROOM screens and to dump them to a printer using a shaded printer dump. The MODE CONVERTER program will convert any graphics screen into a Mode 4 ARTROOM screen ready for loading into ARTROOM. Conversions can be made from Modes 0,1,2,5 and 7. yes SEVEN!

'...very pleased with the way Clares have introduced the colour facility.' A & B June '87.

ARTROOM and ACE will work with any mouse but we recommend DIGIMOUSE because it is well engineered using a non-slip ball and optical encoders. DIGIMOUSE also includes the unique 'LINEAR LOCK' facility that enables you to draw straight lines freehand.

'...impressed by Nidd Valley Digimouse' A & B June '87

This complete package is marketed by Olivetti in Italy, the home of style and design.

ACE A STROKE OF GENIUS!

DIGIMOUSE

BETA-BASE SAVE £7

£30 5.25 inch Disc £34 3.5 inch Disc

The Beta-Base pack consists of Beta-Base, the number one database for the BBC micro, and Beta-Base Utilities which extends the power of Beta-Base.

The main feature of Beta-Base is its ease of use which is achieved without sacrificing the power and flexibility required for the efficient manipulation of up to 65,000 records.

The Beta-Base Utilities provide seven new utilities. There are more powerful versions of Search and Sort and there is also a Mail Merge program which creates perfectly formatted letters containing data from your files.

'We use Beta-Base ourselves' Mike Bibby, Editor of MICRO USER.

'Rated best value for money'—ACORN USER Dec '84

RAMROD

UTILITIES PACK

SAVE UP TO £30

£50 5¼ inch disc £60 ROM £54 3½ inch disc

The UTILITIES PACK consists of RAMROD and MACROM. RAMROD is the ultimate toolkit ROM and it is compatible with the whole BBC range and includes a disassembler plus editors for DFS, ADFS, RFS, memory, Shadow memory, Sideways RAM, Tube plus lots more. RAMROD will take you to the furthest reaches of your machine and enable you to boldly go where no ROM has gone before!

'an ingenious collection of utilities...' BEEBUG Oct '86

'worth its weight in gold.' A & B Jan '87

MACROM is a fast full featured MACRO ASSEMBLER that allows the use of macros, which are loaded from disc. MACROM has its own easy to use editor which automatically formats your source code. A HI version of MACROM is supplied for use with the second processor. A macro library and demonstrations are also supplied.

'Full marks for an excellent product.'—BEEBUG JUNE 1986

We are also making BROM+ available under this offer. Its main feature is the full scrolling BASIC editor which allows the user to edit a program as if dealing with text in a wordprocessor. There are many other features dedicated to making life easier for BASIC programmers.

'This is the best BASIC screen editor I have so far used.' —MICRO USER August 85

For BROM+ add £25 on ROM, £20 for 5.25 inch disc or £22 for 3.5 inch disc.

When ordering please state the following:

Machine
Disc size (5.25, 3.5)
Disc format (40 or 80)
DFS version

N.B. If ordering for a Master or Compact please state DFS or ADFS. The ARTROOM pack is for the Master or Compact only but all other software is available for all machines.

Fontwise + Pack SAVE £10

£34 3½ inch Disc

£30 5¼ inch Disc

The FONTWISE+ pack contains FONTWISE+, the FONT EDITOR and 22 fonts. FONTWISE+ enables you to print very high quality text in a choice of 22 different fonts and 3 sizes. You do not need a special printer, just an EPSON RX or FX compatible. High quality is not the end of the story because you can also have both proportional and justified text. The output has to be seen to be believed.

FONTWISE+ is compatible with WORDWISE, VIEW, INTERWORD, MINI OFFICE II and EDWORD II.

'FONTWISE is better than many NLQ packages'—ACORN USER Sept '86

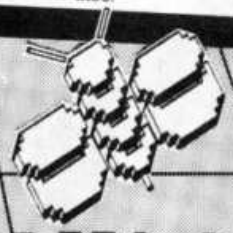
The FONT EDITOR is very easy to use and allows you to edit the current fonts or create new ones. Reviewers have praised the editor for its ease of use and faultless presentation.

'editor is impressively quick, smooth and easy to use'—A & B

EDITOR '...puts all previous designers to shame.'—BEEBUG July '86

Ask for a sample printout.

Suppliers of top quality software for the range of Acorn Computers



Clares

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DON'T FORGET, YOU CAN ORDER WITH ACCESS CARD TOO!

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Volume Five Number Three March 1988

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Archimedes
HARNESS THE POWER

A computer like ARCHIMEDES needs software that can match its outstanding capabilities. Our new products do just that and one of the first areas that you will want to explore is the graphics capability. ARTISAN, from the authors of ARTROOM, is the ultimate in graphics packages. Just take a look at the screen shot reproduced here, as they say 'a picture is worth a thousand words'. We can't describe all the features here but some major functions are:

- Full screen
- Fast multi level scrolling zoom
- Image distortion
- WIMP environment
- Magic brush
- ECF designer

Plus all the usual features and some very unusual ones too.

£39.95

PICTURE THIS

—COMPETITION—

Can you do better than the picture shown here? If so you could win yourself a unique prize. If yours is judged to be the best picture then your masterpiece will be transferred to canvas by our artist Jon Warmisham (BA Hons Fine Art). The competition is open ended but the best picture each month will be featured in ACORN USER and a monthly prize will be awarded. Full details are contained in the ARTISAN pack.

Alpha-Base

Alpha-Base is the successor to the hugely successful Beta-Base, the top selling database for the BBC micro. Beta-Base files can even be transferred to Alpha-Base.

Alpha-Base incorporates all the suggestions and requests that we have received over the last five years. All of the standard Beta-Base facilities are there but in a much improved form. In addition there are many new features that will make your life easier. Some of the features are:

- Free format screens
- Multiple pages per record
- 400 fields & 27,600 characters per record
- 2.14 billion records per file
- Multiple display & entry forms
- Fast search & sort options
- Plain English entry of search criteria
- Five data types including formula & date
- Winchester compatible

At Clares we try to give you usable programs. This results in some arbitrary limits on the size of files in Alpha-Base. The limits of 400 fields and 27,600 characters per record are unlikely to restrict you but they enable us to save memory and provide additional features. The only other limitations are due to the hardware. Alpha-Base can handle 2.14 billion records but the ADFS can't!

£49.95

IMAGE WRITER

IMAGE WRITER is a sophisticated WIMP based wordprocessor with the ability to include graphics as well as to use various font combinations. Because Image Writer is document based you do not have to create page layouts for every page. You prepare your whole document in one go. Just type it, add the graphics and print it—simple. The graphics can be created with the built in graphics editor. Image Writer is designed as a first level DTP product and it uses the normal printer fonts to print both text and graphics in one pass. We will of course be producing a full feature DTP when ARCHIMEDES supports the fancy font printing. Image Writer will be available when you read this so please contact us for more information.

£29.95

ARCHIMEDES TOOLKIT MODULE

ATM is the first toolkit available for this powerful new micro. Many of the features that made RAMROD a top seller have been incorporated into ATM and a whole host of new features have been added including:

- 10 Memory and disc editors
- 8 Memory and disc searches (inc. wildcards)
- A scrolling disassembler
- A one line assembler (accessed from the disassembler)
- Shift and compare functions
- Catall and Exall for discs
- Winchester compatible

If you want to explore your ARC then order the ARCHIMEDES TOOLKIT MODULE today. It has enabled us to disassemble modules, discover many undocumented SWI calls and has been an invaluable aid in debugging software. You can even search for mnemonics.

£39.95

clares

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NEWS

Video Processing at a pinch

For a number of years, a company calling itself **VEL** have been producing a number of Genlock Colour encoding and vision mixing devices to marry BBC equipment to Video sources. They tell me that the Beeb-Lock system is in used in education, industry and broadcast studios all around the world, where there is a need to combine micro graphics with video pictures.

Hokay – nothing too special about that, but ArVis (Archimedes Vision – geddit?) has been introduced by the same people to further enhnce the graphics capabilities of the Archie. In short, the system Genlocks the Archimedes to an external Video or sync source, accepts both linear RGB and PAL encoded outputs, combines the Archimedes Graphics with video using a wide range of computer controlled mixes, fades, keys and other effects.

There are other features such as audio switching, frame grabbing, teletext scanning, digitizing and a nifty remote control facility for external control.

And if you are looking for fully professional video gear, then yes – it does allow for timecode information – and that puts ArVis into a completely different ball game, and no, they didn't include a price.

Contact Video Electronics Ltd at: Wigan Road, Atherton, Manchester, M29 0RH. ☎ (0942) 882332.

Baby Brother is watching you

Micro Robotics have added to their range of Scorpion Systems – the Scorpion Vision System is based around their intelligent controller unit (interesting looking beast isn't it?) and the "camera on a chip" Optical RAM visual sensor.

There are no prices at present, but they claim the system will cost less than £500. You can contact Micro-Robotics on ☎ 0223 462212.

Word Processing Package still at it.

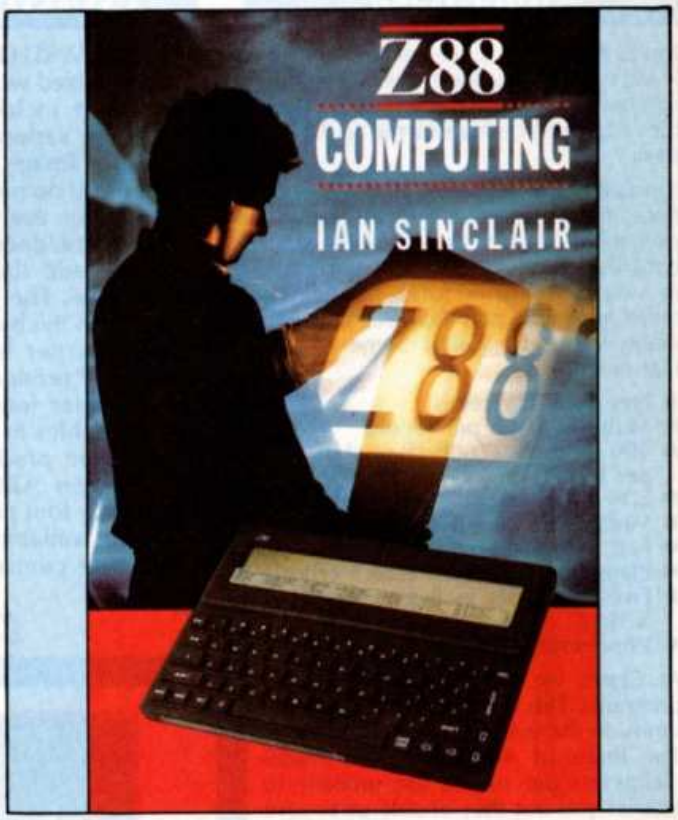
"We're still going hammer and tongs at our word processing package" A little birdy at Acorn told me. This feathered friend was, of course, talking about the release of the Master Compact system back in September to less than rapturous crowds at the PCW show in Olympia.

The system was unfortunately the centre of a scam arranged by another British micro manufacturer (and how many of them are left?) setting up another load of cheap advertising for their machines (no I'm not going to say who – do you *really* think we want to be sued?).

Anyway, the Compact Professional was originally priced at £649 plus VAT for the Monochrome version and £799 for the colour version representing a saving of some £300 over a separate purchase.

Where the real saving come into play is in Acorn's bundling of the Brother HR20 (I am told is the worlds most popular daisywheel price).

Is the package a success? Well, It all depends on what you call a success – look at what you get for your money; a small BBC Master, a disc drive, View, ViewSheet, ViewSpell, ViewStore, a printer and a monitor – it's a lot of money, but then you get a lot of tackle.



Support Continues

After our coverage of the Cambridge Z88 – it is good to see that Ian Sinclair has done the usual and written a 163 page book about it. Z88 Computing **costs £9.95 and is available from David Fulton Publishers.**

Archimedes

BEEBUG the recognised Archimedes specialists.

RISC USER

We have launched a magazine and support group specifically for users of Archimedes. The magazine provides news, reviews, hints and programs, while the support group gives Technical Advice and 5% discount on our range of Archimedes products. UK subscription is £12.50 per annum.

Reserve your Archimedes 400 Series computer NOW.

Archimedes 440s are available Ex-stock and 410s will be available in the first quarter of '88.

ARCHIMEDES 300 SERIES

(Always in stock)

0190G BBC 305 Entry System	803.85
0191G BBC 305 Mono System	861.35
0192G BBC 305 Colour System	1033.85
0193G BBC 310 Entry System	891.25
0194G BBC 310 Mono System	948.75
0195G BBC 310 Colour System	1121.25
0257G BBC 310M Entry System	960.25
0258G BBC 310M Mono System	1017.75
0259G BBC 310M Colour System	1190.25

Trade-In your BBC or Master Series Computer for an Archimedes.

Sample Discounts available:

BBC B issue 7 with DFS	£225
Master 128	£250
Master Compact Entry	£215

Computers must obviously be in good working condition to qualify for this offer.

Please telephone for further details

PRICES INCLUDE VAT

Where two prices are shown, the first is our full price and the second our members price.

ARCHIMEDES LEADS

0558B SKART Lead	10.47	9.95
0425B Archimedes Printer Lead	10.47	9.95
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0796C Serial Link Kit & Disc	18.16	17.25

See next column for details

MINERVA

0920B Deltabase	29.95	28.45
0921B System Delta Plus	69.95	66.45
1233B Sys. Delta Plus Ref. Man.	29.95	28.45
0922B Order Processing	64.95	61.70
0923B Sales Ledger	64.95	61.70
0924B Stock Manager	64.95	61.70
0925B Purchase Ledger	64.95	61.70
0926B Nominal Ledger	64.95	61.70
0927B School Administrator	79.95	75.95
0928B Video Rental	69.85	66.36
0929B Reporter	24.95	23.70
0930B Minotaur Game	14.95	14.20

MEMBERS SPECIAL OFFER

When buying a new Archimedes we will give you absolutely free: "Zarch" the complete Lander game, Printer lead and Lockable 3.5" disc box with 10 discs all worth over £60.

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0260G Archimedes 410 Entry	1608.85
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0262G Archimedes 410 Colour	1838.85
0263G Archimedes 440 Entry	2643.85
0264G Archimedes 440 Mono	2701.35
0265G Archimedes 440 Colour	2873.85

Beebug are a specialist Acorn appointed Archimedes Repair Centre. If you have any problems with your Archimedes we will be only too happy to put them right.

ARCHIMEDES UPGRADES

0266C 0.5Mb RAM (305 only)	102.35	97.23
0267F Floppy Disc Drive	143.75	136.56
0268G 20Mb Hard Disc (300's)	573.85	545.16
0269C Podule Backplane	44.85	42.61
0270D ROM Podule	67.85	64.46
0271D I/O Podule	90.85	86.31
0272D MIDI add-on to I/O	33.35	31.68

5.25" DISC DRIVE INTERFACE FOR THE ARCHIMEDES

(Available End of December)

Connect up to four external disc drives to your Archimedes with our fully buffered disc drive interface. It fits neatly at the back of your machine and requires NO SOLDERING.

Stock code 0795C Members price £24.00

SERIAL LINK KIT & DISC

(Available End of December)

This kit enables files to be transferred between BBC and Archimedes, in either direction, with the minimum of fuss. The software is menu driven and is fully compatible with DFS and ADFS. The three metre lead simply connects between the serial ports and the software is loaded via the Archimedes.

Stock code 0796C Members price £17.25

ARCHIMEDES SOFTWARE

1080B Ansi C	113.85	108.16
1081B ISO Pascal	113.85	108.16
1082B Fortran 77	113.85	108.16
1083B Twin	33.35	31.68
1084B Logistix	113.85	108.16
0900B PC Emulator	102.35	97.23
1095B Artisan	39.95	37.95
1096B Image Writer	29.95	28.45
1097B Archimedes Toolkit	39.95	37.95
1098B Alpha Base	49.95	47.45
0640B Wordwise Plus Disc	23.00	20.70
1050B Viewsheet (Emulation)	59.80	56.81
1051B Viewspell (Emulation)	39.85	37.86
1052B Viewstore (Emulation)	59.80	56.81
1053B Viewindex (Emulation)	14.95	14.20
1057B View (Emulation)	59.80	56.81

ARCHIMEDES BOOKS

1242B Archimedes Ref. Man.	29.95	28.45
1271B ARM Assembly Prog.	12.95	12.30

The CC ROM Podule from Computer Concepts, features seven 128K ROM sockets which can have Battery-Backed RAM fitted to them. **Available End-December.**

0675B 10 x Beebug 3.5" DS Discs	15.79	15.00

OTHER HARDWARE

0805D CC ROM Podule *(End-Dec)*	56.35	53.53

Carriage

Carriage is denoted by the letter contained in the stock code. A-50p, B-£1, C-£2, D-£3, E-£3.75, F-£5.50, G-£7. When ordering several items, use the highest price code and half of each subsequent code. For courier delivery use code G.

Credit Cards

Access and Visa orders are welcome, and may be placed by letter or telephone (24 hours).

BEEBUG LTD,
Dolphin Place, Holywell Hill,
St.Albans, Herts., AL1 1EX.

☎ (0727) 40303

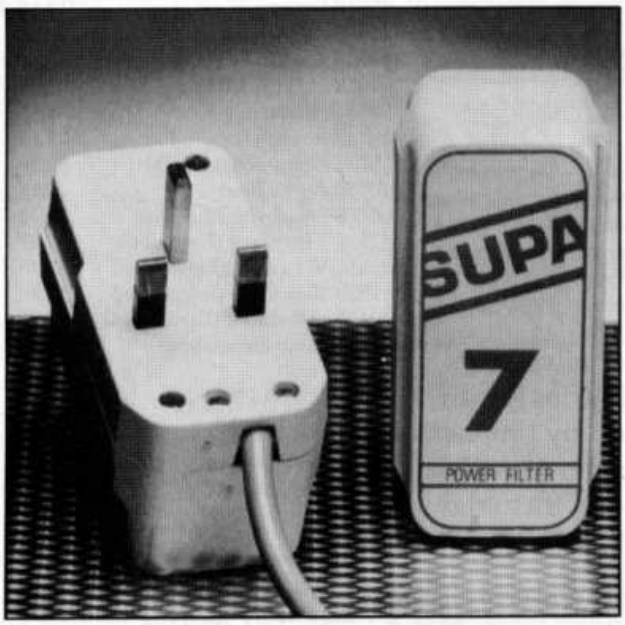
Please telephone for a Free Information pack and Archimedes brochure.

Clean Machine

Yet another mains suppressor has come onto the market; called the **Supa 7**, this delightfully straightforward device cleans up the power supply, thus reducing all the usual "noise" that may (and I stress the word *may*) mess up your computer system.

Warwick Products say that their unit filters out radio frequency interference, "which is a major cause of electronic malfunction". This I would challenge, RFI interference isn't as damaging as some individuals would like us to believe, but then for £14.95 (ex VAT) for protection against the real enemies such as surges and spikes, I'm not complaining!

Contact Warwick Products Ltd. 50 Marsh Wall, West India Dock, London. ☎ 01 538 2535.



Paranoia

Ever since the Data Protection Act **came along to rustle things up in the usually sedate world of databases, paranoia has struck the world of computing.**

What's that got to do with me? You may ask. Well, should you so happen to have a database and you are not registered, then the agents for the Data Protection Act may pay you a visit ... know what I mean?

In order to come into line with the DPA's security requirements, Number 3 Software **of Norfolk have developed an interesting ROM called *The Scrambler*. Designed for the BBC Micro and Master Series, this ROM is a menu driven program with its own password, making BASIC programs, text files and database material free from the prying eyes of those with a vested interest in what you have on your discs.**

The thing that makes Number 3's ROM so different is that it automatically recognises BASIC programs from text files, and database files from spreadsheet records.

The Scrambler is available for the BBC Micro and the Master, and is available from Number 3 Software, 3 Dairy Farm Court, Attleborough, Norfolk, NR17 2BT. ☎ (Attleborough) 454902.

The diplomatic touch

The Master series machines have just netted Acorn a cool £40,000 to teach Japanese Ministry of Foreign Affairs Diplomats with "L" plates the finer points of the English language (if such a thing is possible).

The £40,000 pounds got the Ministry's *Foreign Service Training Institute* a 40 station Econet system; the software is, as yet, unknown, but they have added the Domesday system (and the latest software for it too), enabling the diplomats to have an intimate look at our environment and our way of life – without scurrying around tourist attractions armed with cameras and notebooks.

This may open a few doors for more lucrative orders in Japan in the near future, thus pitching Acorn directly against Wang, NEC, Fujitsu and all the rest ... put *that* in your diplomatic bag!

Acorn's new MD seeks expansion

After the departure of *Brian Long* – Acorn's Managing Director – Bruno Soggiu, his temporary stand-in and full time Chairman of the company was not too quick to appoint a replacement.

But his replacement has just arrived, in the form of *Harvey Coleman*, previously the head of Olivetti's market strategy group at the Olivetti headquarters in Ivrea in Italy.

Should you be worried about Acorn being devoured by its parent company, there's no need to worry.

Coleman's first task is to "make the Archimedes' presence in the educational and scientific marketplace more prominent" – and to many that can only mean more generous bulk discounts, additional software releases and a release of the ARM processor (the RISC chip on which the Archimedes is based) as a realio trulio OEM product.

But does this justify Acorn's axing 49 members of staff last month – primarily in the OEM section of the company? Looking carefully at the high class programming headhunter's journals reveals Acorn's quite heavy recruitment of programmers with "C" kernel and UNIX system programming.

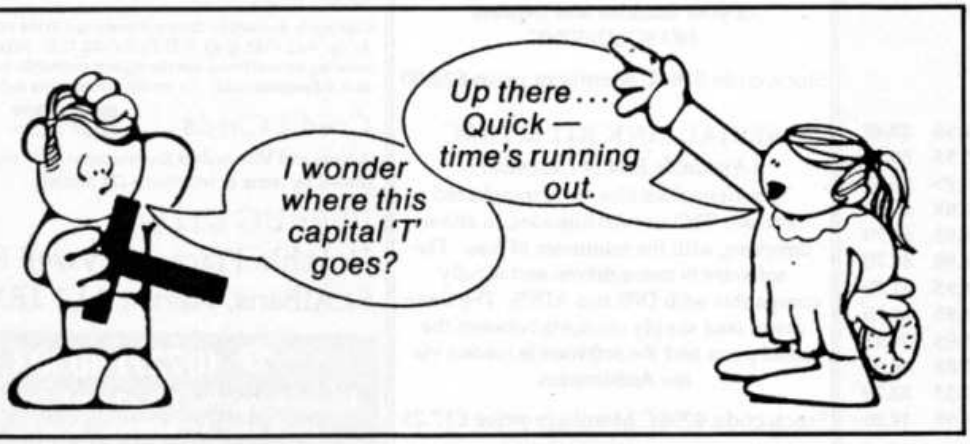
Full Marks

Topologika have released a new educational package for the BBC Micro; called Punctuate, **this package could be the sort of thing to liven up a Friday afternoon for the ageing journalistic hacks around me as I write. It is primarily designed to teach children how to punctuate short stories and sentences.**

The game is simple: you take a short story and load it into the computer, mark out the punctuation marks and letters you want to delete or change, and then prepare for a fast and furious game, full of surprises.

For an "educational" package, it is also quite cheap at £14.95; but unlike a great deal of educational software, it can also come in the form of a Master Compact disc. Be warned though, it is addictive!

Contact Topologika for their catalogue at Freepost, PO Box 39, Stilton, Peterborough. ☎ (0733) 244682.



Buy a Mitsubishi disk drive direct and you save more than money.

You're looking at a more economical and convenient way of buying a Mitsubishi disk drive. Because now you can order a 5¼" floppy disk drive from one of the world's leaders – direct from this page.

With prices that start from £99 (plus p&p) this will save you money. With only a walk to the post box involved it will save your soles too.

The four Mitsubishi disk drives offered here are all BBC Micro compatible. Each comes with a 2-year warranty from the manufacturer that's famed for reliability. And all are boxed and ready to plug into your system the moment they arrive.

So fill in the coupon here and return it with your remittance.

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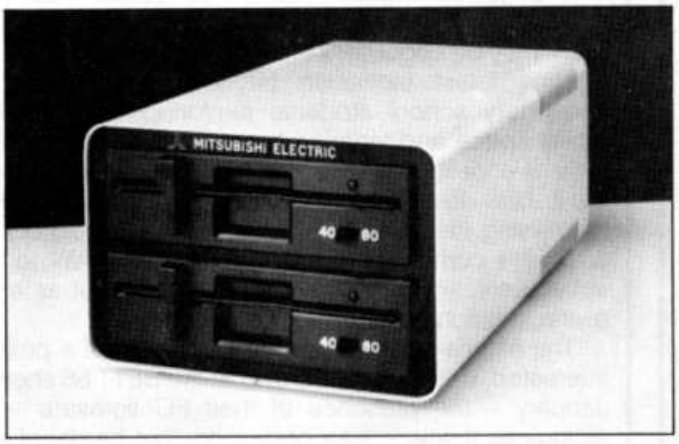

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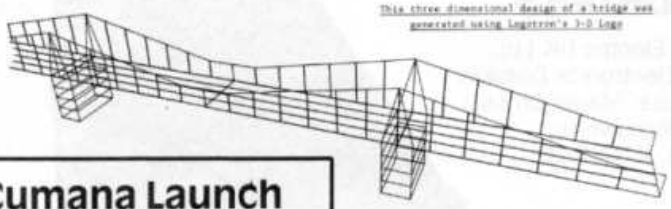
Logotron release update at BETT show

The Logotron implementation of LOGO has had another upgrade added to it – and rumours suggest that it may be Logotron's last for the BBC Micro.

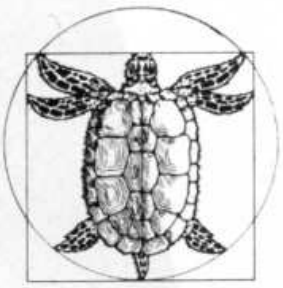
Their latest extension pitches this software at secondary school students exploring three dimensional space and learning how to represent it as two dimensional figures. The extensions add a third axis – the Z axis – to the turtle's range of movements. As well as utilising the standard "2D" movements, 3D LOGO adds the commands PITCH ROLL and YAW to the vocabulary, so that it can freely move about as a 2D representation "in 3D space".

The extensions were launched in front of a politely interested, but reserved, crowd at the BETT 88 show in January – the presence of their PC software – insidious as it was – was interesting, but hardly of any importance by comparison.

Contact Logotron Ltd at: Dales Brewery, Gwydir Street, Cambridge, CB1 2LJ. ☎ (0223) 323656.



This three dimensional design of a bridge was generated using Logotron's 3-D Logo



Cumana Launch new hard disc drive

In the light of Viglen's latest winchester drive, and Watford's new super low price model *(See this month's Watford Winchester review by Mary Branscombe)*, Cumana have come up with a range of small but, as yet, unpriced winchester drives ranging from 20 megabytes of storage to 56 megabytes.

As usual, all the standard utilities are included, allowing for DFS to ADFS transfer (and vice versa), enabling the machine to be used with the old 8271 DFS filing system – which, when compared with the power and flexibility of the ADFS is a pointless waste of time, but the facility is there should you want it.

Cumana have the advantage of being just about the most experienced suppliers of hard discs to the BBC Micro world – both for business and education/ research. There are rumours that they are producing a small internal drive for the Archimedes but at costs that will severely undercut the competition, ie Solidisk and Acorn.

For more information contact Cumana Ltd, Pines Trading Estate, Broad Street, Guildford, Surrey, GU3 3BH. ☎ (0483) 503121.

Archie BASIC for the Beeb.

Well I suppose someone had to do it! And **Tubelink,** are the people with the dubious honour of releasing a version of Archimedes' mother tongue for the BBC Micro or Master with a 6502 co-processor (including the old 6502 second processor).

Before you all start screaming *Eureka,* I must temper your pleasure by telling you that it won't actually turn your Beeb into an Archimedes (where the hell are you going to get 512K to begin with). But it will give you nearly all of the most useful BBC BASIC V commands on a single ROM or as a Sideways RAM image.

Tubelink have done their best cramming all of the extra commands into the Beeb, and amongst all the usual additions, they have included the CASE statement along with OF, WHEN, OTHERWISE, ENDCASE, IT, THEN, ELSE, ENDIF and the now-famous WHILE/ ENDWHILE structures.

As well as supporting all of the usual graphics and error handling facilities, Archimedes BASIC extends the MODE command – amusing to say the least, and the MOUSE commands which are impressive to say the least.

I've left the best bit till last – Archimedes BASIC is token compatible with the real McCoy, that means you can transfer software (written in Archimedes BASIC of course) without having to go through the rigmorole of SPOOLing and EXECing the file first.

So, what you get is 40K free to programming in Archimedes BASIC, it is faster at many Maths functions than HIBASIC and is more accurate than the pre 1987 version of the language.

If Father Christmas didn't give you an Archimedes this year, it may be worth having a look at this package so you can develop programs on your Beeb whilst you wait for more material prospects – but you do need a 6502 second processor.

Contact Tubelink at PO Box 641, London, NW9 8TF. ☎ 01 205 9393.

All quiet at Superior.

Things must be really quiet up at Superior Software these days, judging by their riveting press releases we have been receiving this month:

For example, the most exciting thing they had to tell the trade this month was about *Kenneth Campbell's* (Superior's Sales Manager) car crash. I am sorry to hear that Ken, but is this *really* press release material? Anyway, what do they do? Send us a press release of him trying out a mini Porsche!

Oh well, anything to knock a few more trees down.

► ► ►

Archimedes Competition Winner!

Well it was a hard choice, and a moral dilemma as well (do we take it for ourselves! – perish the thought), but in the end good prevailed, and the first correct entry out of the postbag(s) was from a *Mr D Stanford* of Kinross, Tayside ... Lucky man!

Your prize will appear as soon as we can prise one out of Acorn.

For all of you out there wondering about the cryptic clues in Abbas' artwork, the answers are as follows:

- **The large catapult for throwing large stones.**
- **The ratio of the volume of a cylinder to a sphere placed in it.**
- **He measured Pi by drawing a circle and a series of polygons inside it.**
- **The crown represented his measuring the specific gravity of substances – entrants also had to point out that King Hiero of Sicily's metalworkers had stolen some of his gold – hiding their crime by alloying it!**
- **Everybody got Eureka (I have found it) – Archimedes' most famous proclamation (as fable has it), but it also pointed to his discovery of water displacement.**
- **He discovered the centre of gravity and used this to show that if equal weights were placed at different distances from the point of support, then the one further away would descend.**

So now you know.

Disk User – finalist in the 1987 Magazine Publishing Awards

Disk User for the BBC Micro was one of the stars at the 1987 Magazine Publishing Awards. The trailblazing Disk User was the only representative of the computer magazine industry amongst the big guns of publishing.

The Publisher magazine each year chooses a distinguished panel of industry experts to judge nominated magazines in 17 different categories. Disk User for the BBC Micro was nominated in the category of most successful spinoff magazine because it was launched out of sister magazine A&B Computing.

Although only two issues of Disk User had been published at the time of judging, the magazine was runner up in the category. At the Magazine Publishing Awards luncheon on November 11th, guest presenter Sue Arnold of the Observer, handed over the finalist's certificate to Disk User editor Mark Webb.

The judges praised the speed at which the launch was accomplished and were impressed by the "sheer value of the cover-mounted disk that formed part of the new publication's concept".

We've got a Sidekick!

Fun product of the month has to come from DABS press for their innovative new package called *Sidewriter* – a memory resident notepad designed for the Master 128 and Master Compact. The beauty of this package is that it can be used at any time with any program running in the BBC micro – and that includes arcade games.

You load sidewriter into your machine after powering up (even from an ADFS !BOOT directory if you so wish) and it stays dormant until you press <Ctrl> <Shift> and the <Tab> keys simultaneously – up pops a Mode 7 screen and *voila* you are into Sidewriter.

Now, of course, the concept behind this is not new (what is these days?) But DABS' package is nice and simple and *cheap*, at £7.95 for a 5" inch disc and £9.95 for the 3½ inch version, DABS certainly know how to attract attention for themselves – good luck guys, you're going to be swamped with orders!

Contact DABS Press at: 76 Gardener Road, Prestwich, Manchester, M25 7HU. ☎ 061 773 2413.

Interactive '88

The day most of the inhabitants of Brighton will remember because Woolworths burned down, was also noteworthy as the final day of Interactive '88, a show full of interest for BBC Micro enthusiasts, especially in education.

The show spanned 1-3 December, with the 2nd being, by all accounts, the "selling" day.

Acorn and BBC Enterprises combined to show the AIV Domesday system but there were also BBCs all over the place, plugged into both disc and tape based systems.

Coming from the computer end, what couldn't you do with an Archimedes and a Watford Electronics digitiser and software?

Mike Harrison's capture and effects software gets faster and better every time it goes on show. Mike was demonstrating it himself at Interactive '88. Any part of a digitised picture can be instantly cut out, resized, flipped horizontally and/or vertically, mirrored, copied and so on. It's exciting, out in January some time and we'll capture its essence and present it in A&B just for you!

Oops file under blunders (again!)

Aaargh! I can't take it! Not only was there a mistake in January's A&B, but the corrections that were supposed to go in February's issue got left out! I am praying these ones will go in so here goes:

My apologies go to the authors of Beeblink for the mistakes... Photographs of your Assistant Editor eating one of his many hats are available in the foyer. And now, after such a rude awakening, we can continue on our journey to blissful Nirvana. Ommmm.

Listing 1:

```
530IFB%>&4000 C%=B%:J%=OPENUP $na%:PROCop
ELSEPROCal(CHR$129+"LOADING from"):H
%!2=HIMEM:H%?6=0:PROCarg(255)

1200IFC%=0 PROCsv:PROCo("ACCESS "+$na%):J%=OPENUP
$na%:PTR#J%=&4000:C%=255 ELSE
FORV%=HIMEM TO Z%-1:BPUT#J%,?V%:NEXT
```

Listing 2:

```
>L. 90
  90X=EXT#OPENINN$:UNTILX>0:CLOSE#0
>
>L. 110
  110OSCLI"LO."+N$+" "+STR$~(PAGE+&2000)
```

DABS PRESS HYPERDRIVER: Printer Power

HyperDriver is an amazing new companion ROM for all Epson-compatible printers, unleashing all their capability, without resort to complex programming and arcane lists of numbers. Over eighty (yes 80!) star commands provide *all* printer functions. As well as all the standard FX80 commands, your own macros may be built. For example, one customer uses these for colour codes on his Integrexprinter. For VIEW, a special printer driver is provided in the ROM, which provides a unique and invaluable on-screen preview facility, which is available from BASIC as well, and yes, microspacing is at last supported! If you haven't got an NLQ font, don't worry, a beautiful proportional NLQ typeface is built into the ROM. Also you may print using the BBC Micro character set, including any characters you have defined. **HyperDriver** costs just **£29.95** for the 16k ROM, utilities and examples disc, and comprehensive 100-page manual. (Full data sheet on request).

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Dave Reeder

THE ARCADE

Another year passes and Beeb software still drops upon us like silver rain – sometime gems appear, sometimes dross

Welcome!

The astonishing thing, perhaps, is that there is still class games software for the machine that was written off by the 'knowledgeable' computer press a couple of years back and which is never included any more in those annual hardware choice articles that I've been reading in the December "fill your stocking with these" articles that desperate computer press journalists are reduced to in the run up to Christmas.

Hopefully, we've moved from that. Our thoughts now are of cold winter days and we are all looking eagerly for the hot games that will warm up our keyboards and cause us to shed the mittens that make game playing so awkward!

Not an easy task – there's a fair bit of software this month (plus some great tips), but what will set you and your bank balance aflame?

You tell me. I've included some Arcade choices of the year but I'm keen to hear your views of the Beeb software scene at present. Write in today – there's an old cardboard box of software here for the reader that tickles our fancy the most...

Game of the month

Star Wars Domark Model B Tape/disc £9.95/£12.95

Graphics/sound 8 Playability 8 Originality 8 Options – Value for money 8 Lifespan 8 Overall 8

This was quite a hard choice this month – your correspondent was torn for days between the delights of this accurate arcade conversion (admittedly of a rather ancient arcade classic first seen some four years ago) and the enjoyable Superior release *Bone-cruncher*.

In the end a class conversion won, rather than an imaginative reworking of *Repton* (see review below for details) but it was a close thing.

The difference, I suppose, between companies like Superior or Tynesoft who are committed to a large volume of Beeb releases and those, like Domark, who see Beeb owners as a worthy part of an overall strategy whose main strength is the quality of each Beeb release.

Enough waffle – what about the game? Based, it says here, on some minor science fiction movie or another and coded by Vektor Grafix, it is very close indeed to the Atari coin-op; except slower, of course.

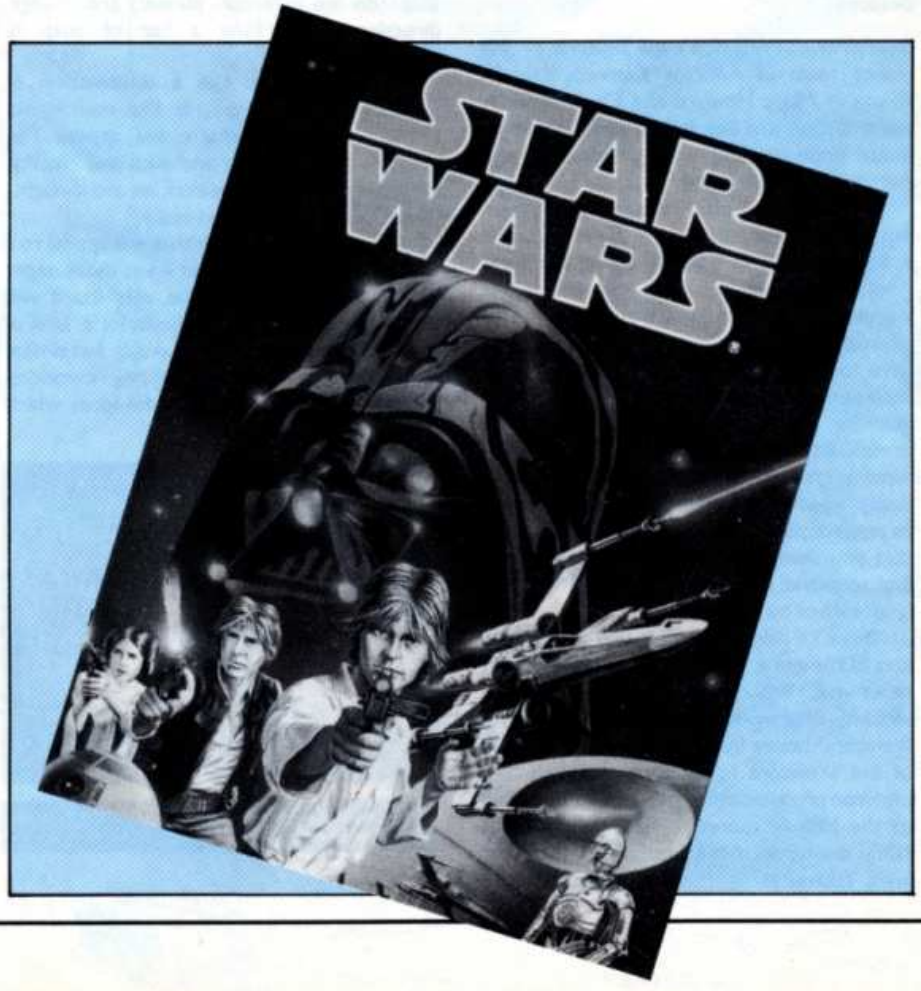
Fans of vector graphics and minimal colouring will have a field day but, rather like *Elite*, those elements are not essential – what matters is the game play and that is full of adrenalin pumping excitement (Reviewer's Cliche No: 23 – collect the set).

Assuming you've seen either the film or the coin-op, the game is easy to explain. Three different levels of attack (yes, I know it's not much but don't worry about it) offer you the chance to sharpen various arcade reflexes. Firstly, you must survive waves of TIE Fighters which attack your lonely little X-Wing as you try to fight through to the Death Star. Once there, you close in on the ground-based space towers and a steady barrage of enemy fire before reaching your final objective – the trench.

Oh no, not the trench! Not to worry – you only need split second control and timing to avoid the barriers and missile emplacements before destroying the Death Star with one perfectly placed shot.

This was never a particularly detailed arcade classic but classic it undoubtedly was. Forget the film (unless you're about eight foot tall and very, very hairy) and enjoy the combination of manoeuvering and shooting skills required. Good arcade conversions *not* written by Peter Johnson are rare beasts on the Beeb – this is one of them. Capture it before it is too late.

And may the Force be with you. Or something; you may need it for the projected 1988 releases of *The Empire Strikes Back* and *Return of the Jedi*.



ARCADE Alley

Kourtyard – in the vein of Ravenskull.

Star Wars – the loading screen.

Dem Bones, Dem Bones

Bonecruncher Model B/Compact/Electron Tape/disc £9.95/£11.95/£14.95

Graphics/sound 9 Playability 8 Originality 7 Options quiet Value for money 8 Lifespan 7 Overall 8

Repton lives! Well, don't tell Superior or the coding team of Andreas Kemnitz, Martyn *Palace of Magic* Howard and David Hoskins but this plays just like another of the eponymous (look it up!) series, featuring the Arcade's favourite lizard.

That, and a touch of *Ravenskull* perhaps. But let's not get too picky – this is great fun in its own right too. So, following the great Arcade tradition of ignoring the awful storyline, what is the game like to play?

Imagine a lizard-based game where you have to collect keys to open doors, gather skeletons and avoid monsters and spiders. Ho hum. But don't despair – the game does offer several intriguing twist on this basic idea – most notably in the person of semi-zomboid Fozzy, your partner who can be positioned to protect you from monsters and so on. Not that you always need him, of course, as the first screen at least can be completed in total ignorance of his whereabouts.

Okay, I'll have to weaken and tell you the idea of the game. The review makes no sense otherwise. You, poor sap, are Bono the amiable dragon whose task is to gather skeletons' bones inside the castle – each set of five skeletons followed by a touch of a cauldron produces soap that must be delivered to the bathing monsters. Five bars of soap safely delivered move you on to the next level. Yuch city!

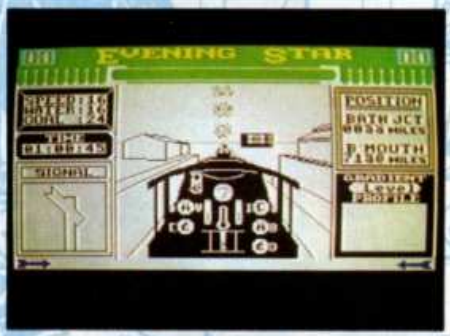
But, to complicate matters, you must also collect keys to open up parts of the castle and, more importantly, avoid the various nasties – the monsters, spiders and the glooks, who are attracted to the smell of soap (do me a favour, please!) and change direction every time a bar of soap is delivered.

The game plays like a combination of Repton and Ravenskull, as I've mentioned, yet it has its own charm and appeal. The graphics are great fun and nice and chunky, the gameplay involved is intricate and thoughtful and success is not won easily.

All in all, this is a game that will appeal to a section of the Beeb market – yet those eager for new adventures of the wily lizard will have recently picked up Superior's *Life of Repton* and so may not be ready for similar antics. Final verdict? An intriguing reworking of some already very successful ideas which reflects well on the coding team but less well on Superior, whose reputation for original games is beginning to curl at the edges.

Still, great fun, great value, etc etc. And, to save you hunting through the Hints 'n' Tips section, here are the various level passwords for the different levels and, no, they won't help you to win the competition:

Beginner, Atomic, Complex, Animal, Nominal, Cabbage, Tolerance, Overlord, Crazy Cave, Crossword, Interest, Pewter, Undertake, Collapse, Generate, Torture, Amendment, Ultimate, Monotone, Countdown, Fatigue, Sabotage, Darkness, Excalibur, Dungeon.



Evening Star – note the master's inability to deal with some graphics.

Chuff! Chuff!

Evening Star Hewson Model B/Master Tape/disc £9.95/£14.95

Graphics/sound 6 Playability 8 Originality 8 Options quiet Value for money 7 Lifespan 7 Overall 7

Change of pace time, zappers. Now, I'm not one of those who ever succumbed to the delights of steam railways (although a trip on the Ffestiniog slate railway in the snow was quite amusing as I recall) and so I approached this game with caution – especially as our competition had been supplied with it a couple of months ago – I mean, how can I take any game seriously that isn't sent immediately and exclusively to The Arcade?

And, to my complete surprise and amazement, I really enjoyed it. Imagine for one moment that you are in the driving compartment of an old steam train – signals ahead, stations to set down at at precisely timetabled intervals, etc. Pretty radical stuff, eh?

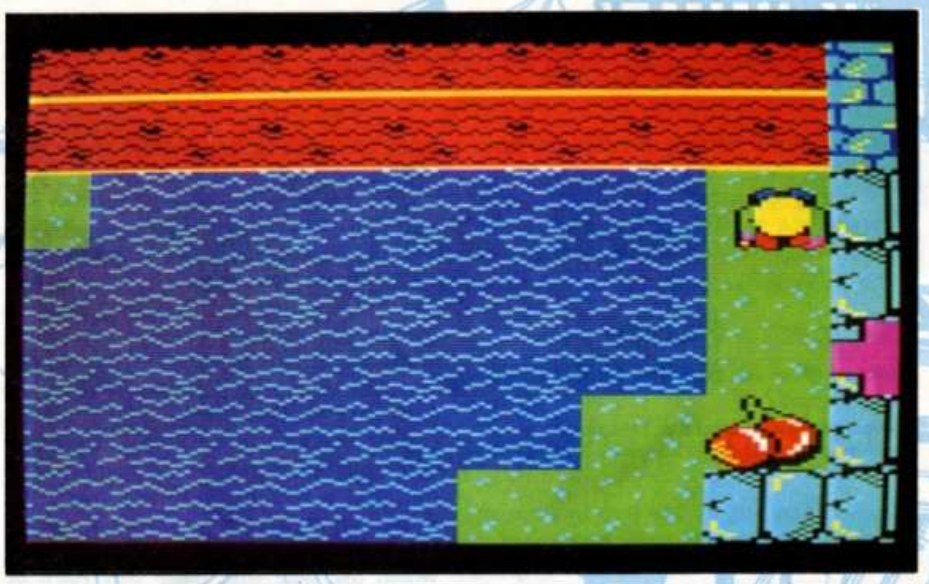
Well, I'm afraid that sarcasm does not win the day on this occasion – the simulation by Mike Male and Bob Hillyer will win you over even if you've never had a moment's inclination to take the blue train down that old lonesome line.

This is great stuff, no kidding. Leaving aside the excellently written and detailed instructions, just imagine for one moment how you're going to conduct this train ride down 70 miles of track between Bath and Bournemouth with no aliens to blast and no clues to solve. We're talking linear game-play here and despite the technical nature of the instructions (well, just recall how bemused you were when you first tried to master a Spitfire) the game is easy to get into, if hard to succeed at.

The display is very basic – a few dials and gauges plus a minimalist line drawing display of the track ahead with which, together with a helpful map of the route ahead, you need to keep your wits about you.

I'm a great one for whacking the disc in the drive, ignoring the instructions and planting a finger on the auto-fire but for this game another strategy is called for. The manuals make essential reading and the game has a special personal and compulsive appeal. A large range of options (allowing everything from basic practice play to full-blown simulation) suggests various levels of enjoyment and commitment by trainee train staff and this is a more than worthy successor to Hewson's earlier simulation *Southern Belle*.

Can I suggest, without putting my zappper credentials too much on the line for the present, that you try and track this game down – I think you'll be as pleasantly surprised as I was by the sophistication of the package.



Kourtyard – again, a challenge.

Bug-Byte Compilation I

Bug-Byte Model B Disc £7.95

Compilation Overall 6

The first *Bug-Byte Compilation* was an interesting package at a very welcome price, sadly the same cannot be said about this sequel.

Of the four games included here, there is only one that is worth seeking out for your collection (and dedicated Arcaders will surely have this already) – the excellent arcade adventure *Hunkidory* by our old friend Peter Scott, or 'Hunky' Scott as Bug-Byte rather charmingly call him! We written enough about this game in the past so all I need to reiterate is that this would be an excellent introduction to the original games world of Peter.

An excellent introduction, that is, were it not for the fact that you'd then also be saddled with two of the poorest games in the Bug-Byte catalogue. I hate to be mean, but the two sports simulation *Cricket* and *Ice Hockey* do nobody any favours, least of all, the programmer Margaret Stanger. They look and play like magazine listings and I am not at all impressed with them.

However, an interesting oddity from the past, is the final game on offer – Jon Niblett's arcade adventure *Jack Attac*, a kind of *Jet Set Willy* clone. Poor graphics, a limited number of screens (only 45) and a less than inspiring scenario still don't spoil my limited enjoyment of this game. However, this is not one that I will return to often.

So, is it worth the cash? Yes, probably – but only to get Hunkidory on disc at a cheap price. Bug-Byte has some other intriguing games still hidden in its back catalogue – how about a compilation featuring *Savage Pond*, *Megarok*, *Roboto*, *Uranians* and even *Oblivion*?

Reissue of the Month

Moon Cresta Alternative Model B Tape £1.99

Graphics/sound 7 Playability 7 Originality 6 Options one/two player Value for money 9 Lifespan 8 Overall 7

Good old Alternative – and there's a name you'll see quite a bit this month as they've just deluged me with an enormous parcel full of the budget goodies and other games that they're slipping out on the quiet.

Most impressive is this reissue of the Incentive conversion of coin-op classic *Moon Cresta*. Remembered chiefly (if at all) for its crazy, and virtually unworkable Lenslock security system, this is a fairly standard space shoot 'em up seen in a hundred versions from Superior's *Star Striker* onward.

This is the one where your three part spaceship has to shoot all the aliens twice to destroy them and where the only breather

Bonecruncher – at last it loads!

Star Wars – at play.

you get is the docking practice between levels.

Nothing outstanding here but superb value for the money and it is great to see classics being prized out of back catalogues to entertain us again.

Sick as a Parrot

Soccer Boss Alternative Model B/Electron Tape £1.99

Graphics/sound 4 Playability 5 Originality 5 Options save game Value for money 7 Lifespan 5 Overall 6

Originally released as *The Boss* by Peaksoft, this is one that should really have stayed in the cupboard. I'm not keen on sports simulation, even less keen on the seemingly bottomless pit of football management games.

If you're looking for a chance to manage a football team then, I'm afraid, there are better options than this. However, if you want to gamble two pounds on manipulating players in the transfer market, watching the score table flash up to depress you and wondering why games were ever written in BASIC then there is little I can say to dissuade you. Is there?

Creepy Cave

Atlantis Model B/Electron Tape £1.99

Graphics/sound 7 Playability 7 Originality 6 Options sound, joysticks Value for money 7 Lifespan 5 Overall 6

If you're only one of those gamers who doesn't expect a ten pound game from a two pound budget release, then this will probably satisfy you. The rest of us, however, have, I think, moved on slightly in our expectations.

This fairly standard platforms game by Rob Dulstone is, to be frank, just that – fairly standard. You have to do a lot of the usual fun things – jump from ledge to ledge, collect keys and objects, memorise the workable routes round screens and so on. All this in pursuit of a rather sweet ghost who's stolen your front door key!

I don't mean to sound too harsh with this game – it's got its own quiet charm and could find some admirers out there. Especially for the money.

Life on the Road

Rik the Roadie Alternative Model B/Electron Tape £1.99

Graphics/sound 8 Playability 7 Originality 8 Options – Value for money 8 Lifespan 7 Overall 8

Curiously, The Arcade missed this game, despite it being reviewed by our 'competition' a couple of months back. Perhaps Alternative thought I'd dislike it. Far from it – this is the most amusing new budget release I can recall for some time.

Coded by three people (S.S. Guest, J.B. Hamblett and J. Gardiner) which is usually a sign of real trouble, the game allows you to pretend that you're the roadie for a rock band. Split into three parts, you have to master three different types of game before being rewarded by a neat demo of the band playing.

The game is full of nice touches – I especially liked the scrolling instructions on the title page which move around the title, suddenly reversing when they hit a corner. Just as you're used to that along comes a message that can only be read as it reverses – all just to tell you that it can only be read that way and to apologise for the crick in the neck. My kind of guys, these.

The first part of the trilogy is a rather long road race, seen from above, as you drive the group 200 miles to the next gig. Graphically nice, it is a little long and the dual constraints of avoiding accidents and staying within the time limit mean that you'll be sacked by the group quite often.

Assuming you get through this test, you next have to unload the equipment without exhausting yourself or dropping it before setting up the mixing desks to the right levels. All good clean fun.

An excellent budget game – do track this one down.

Triple Deckers

Alternative Model B/Electron Tape £1.99

Compilations overall 5

I don't usually bundle together game releases in this way, but it does seem to be the only way to cope with the pile of *Triple Deckers* that I've just waded through. Under review here are volumes 1, 2, 5 and 6 – I've a couple more here by the keyboard but I just couldn't face them.

These are real oddballs and could catch a lot of you out. Alternative are usually very good at labelling just what they're selling you – the *Moon Cresta* rerelease this month, for example makes it very clear that it was originally released by Incentive.

However, they are being very careful not to tell you what these gems are; hardly surprising, since all the 12 games here (three a cassette – Triple Deckers, remember?) were originally magazine listings – but (and that is a great big BUT) magazine listings from Electron User! Cripes – they're not even for the Beeb at all and, in fact, a couple of the games won't even run on the Beeb unless you tweak the listings a bit.

Not that that's hard – they're all in BASIC and, helpfully, mostly list automatically when you press Break. Stranger and stranger.

Okay, so what do we have here? Well, we have a chance to name names and embarrass a few people! From the top, then:

Volume 1 contains a very poor copy of *Stock Car* by S. Merrigan called *Grand Prix* complete with fun spellings like "competators"; an adequate, if not very exciting platform game by M.P. O'Donnell called *Manic Mole*; and a truly dreadful racecourse betting game, *Day at the Races*, by Simon Brett.

Moving rapidly onto Volume 2 we have S.Martin's Space Invaders clone *Invasion Force* whose only virtue is speed (thankfully it is over very quickly); an oddity called *Haunted House* which shows the only touch of originality in these tapes – hardly surprising, since it's a *very* early game by the great Peter Scott but, for God's sake, don't remind him of this; unfortunately, A.G.Martin's *Parachute* which is one of those catch the dropping men games that I know you've all been hankering after.

Sadly I haven't yet seen Volumes 3 and 4 (who knows? They could be great...) but Volume 5 moves inexorably on with a double helping of R.A.Waddilove, firstly with *Starfight* or, as the listing prefers, *Star Fighter which thankfully doesn't want to run on my Beeb and secondly the "classic" Skramble* which is based on a space game so old that even I don't recall the details; however, bringing up the rear with distinction is M. Holroyd's two player *Karate Warrior*, which even in its necessarily cut-down form (only four moves each) is graphically interesting and quite fun to play.

So to Volume 6 which is the last one I can face this month. Explore the caverns in your spaceship in S.Merrigan's *Cavern Capers*; play computer snap and watch the dragon breath fire (yes, really!) in *Snap Dragon* by the deadly duo P.Ord and K.Owens and then thrill to the excitement of Martin Hollis' *Castle of Sand*- can you complete your castle before the tide comes in? Well, can you? *(Please – no more! – Assist. Ed.)*

I'm not often unpleasant about games. Each one represents a lot of work by a number of people and we shouldn't really laugh about these listings. They're not dated but probably emerged from the early years of Electron User. Hard to admit, but even A&B has published some pretty dreadful games in the past.

Still it seems a little unfair to release them as super value budget releases. A lot of games players are going to be very disappointed they bought these. Why should you worry, though? After all, you've not had to play all 12 games just in case they were worthwhile.

Excuse me. I think I just need to go and lie down for a little while. I've come over all faint. Must be the excitement. Or something.

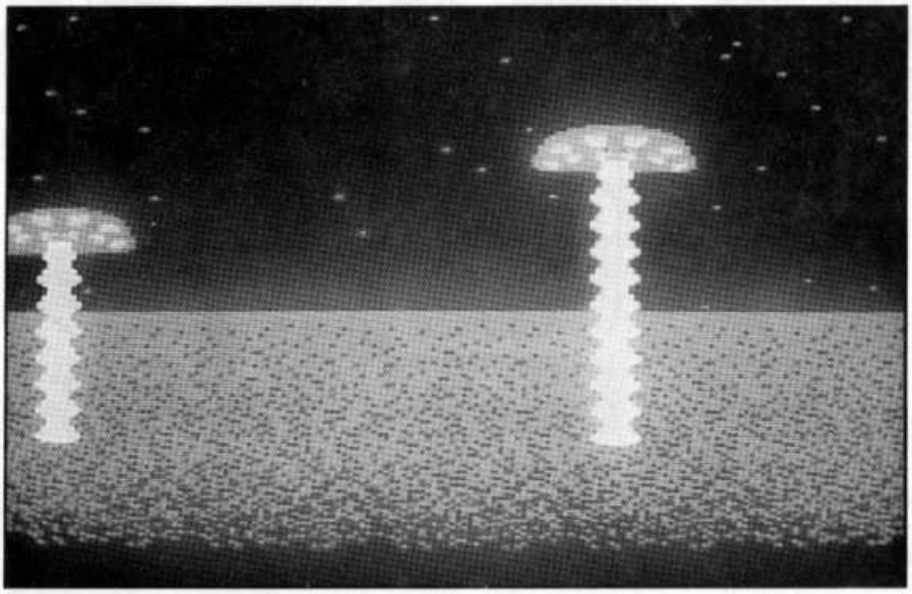
Repo Ball Diary

The diary of this John Mackay game moves on apace, with the coder of *Green Beret* and the intriguing *Krakout!* detailing for Arcade addicts the day by day struggle to finish the game on time for our deadlines. Will he finish it on time? Will it be any good? Who is going to release the game?

The questions are easy. The answers may take another issue or two to become clear. Meanwhile read on and enjoy the sight of man pitted against machine to tweak the last byte of memory out of our favourite machine and to astonish the game-playing world.

Don't worry. I'm confident he'll finish it on time. I just wish that John was equally confident! Until then, I'll leave you with John Mackay and his *Repo Ball* diary.

Tuesday, 24th November. Plonked all the



Repo Ball in the making.

background blocks into the memory ready for the scrolling system. So far, they stretch from &36E0 to &4000 and that means that I've only used about half the space that I've reserved for them. The guardians will use a fair bit of this though. Almost beat the second Chinese dude on *Street Fighter* in the arcade today. Kicked him to near-death when suddenly a double roundhouse to the nut prematurely ended the game! Baldy auld (expletive deleted).

Wednesday, 25th November. Wrote 90% of the scrolling controller! We are talking one heavy routine. I'm using the stack, by the way, as a buffer for the new screen column, which is 192 pixels tall. This leaves a comfortable enough gap between the graphics and the stack's so there shouldn't be any spurious crashes. Watched 'The Sure Thing' and hit the sack about 4am.

Thursday, 26th November. Finished off the controller and squashed a grotty wee bug that was hiding in the code. It was causing the wrong part of the moon to come on and almost caused the untimely demise of my Beeb. While were on the subject of bugs, I always wondered if anybody ever just sprayed a fly with the recommended dose of fly killer! I always drown them in the stuff and I don't know anybody else who does differently.

Friday, 27th November. Started typing in the data that makes up the blocks that are bolted together and sit on the moons as complete structures. The blocks are 16 pixels wide by 24 pixels deep. This means that 6 bytes are used to define each of the blocks. There is a byte for each sub-block with a byte for reflections going on inside it and a reference byte for locating the proper six bytes i.e. two blocks may use the same set of six bytes to define it but they will have different reflections. I was going to use the two top bits in the byte to signify reflections but there are going to be more than 64 blocks. This lends itself to more complicated reflections though i.e. multi reflections within a block with chars 1 and 5 normal, 4 reflected horizontally and 2 & 3 reflected vertically and char 6 reflected both ways for example.

Saturday, 28th November. I've been trying to work out a decent method of moving the aliens since I started the game and at last I've cracked it. Nice circular and smooth movements instead of the old 30, 45, 60 and 90 degree attack patterns. There are a few attack patterns in the elliptical shape of Saturn's rings. I've also been wondering whether to include a reversal sprite routine or a buffer for graphics to be reflected into beforehand. I'll have to decide after I've made a few more calculations. The scrolling routine has now put on a few extra pounds.

It takes about 8 chars (64 pixels) of raster time to do all its decompression, extracting and plotting so it doesn't fare too badly at all remembering that it plots into a buffer then onto the screen. It now goes from &1300 to &1836. Soon I'll be able to give it a silly name. How about....

'Repo-Vision'! Yes, folks!!! It's what you've been waiting for. After months of development it has arrived. State-of-the-art in software engineering has brought you the impossible. See 'Repo-Vision' in action in *Repo Ball* - the next forthcoming attraction etc....

What a load of bull. "Ultimate play the game" pioneered this nonsense and it is still going on. Incentive are the latest to fall foul of this syndrome with their "Freescape" technique. Milking in its truest form.

Sunday, 29th November. Spent four hours with Colin Brierley, the guy who wrote the music, getting the first riff in. I got a bass (well, as best as I can get) by using channels 0 & 1 to give a pulse wave. I wasn't sure if the bass was going to be much cop but it does and the whole thing sounds about right. Channel 3 is inactive in certain places and could be used for filling out the sound. I drew a couple of sprites later on but nothing else done.

Monday, 30th November. Spent three late hours battling with the sprite routine, trying to coax a little more speed out of it to no avail. The problem is that the Repo Ball is 18 pixels deep and my routine only works in multiples of 8. I rewrote it two different ways but it just wouldn't play ball. Because it's having to cross an extra boundary in its worst case, it takes up an extra 6 pixels of raster time. Even the normal size shows an overrun of time due to extra processing. Six pixels might not sound much to some of you but if you're plotting five sprites twice then that works out at *60 extra* pixels of raster or seven and a half character rows.

This is about as useful as a chocolate teapot and would mean having only one or two baddies on screen. This increase in time sounds very dodgy indeed. If nothing is wrong then I'll plot 16 rows of the ball and tack the last two on by an extra very small routine to save speed loss. Whatever it takes, I suppose.

Tuesday, 1st December to Thursday, 3rd December. We apologise for this interruption of transmission and hope to rejoin you as soon as possible!

Friday, 4th December. Krakout! gets Game of the Month in A&B. Right on Dave! More hacking away produces a couple of nice sprites, one of which is only 10 pixels by 16 and so I'll be able to get five on. I'll do a couple of slightly smaller sprites so that I can get six on but these will just be rocks or something 'cause anything smaller than 10x16 looks weak. I'm also re-arranging the game play a bit. I think that you'll have to destroy every Sat structure on a moon to re-stabilise it so that when you come out of the reactor room, the moon will be flat enough for the epic battle between Ball and guardian without having to slow down for landscape. If you run away from a stationary guardian then it will send a bunch of trigger happy Sat's to apply some duress! "If you're gonna die, die with your boots on!"

Saturday, 5th December. Drew up some more sprites and worked a bit on the movement patterns. I was going to use some bouncing fire hydrant type aliens (from *Nemesis*) but it seems that *Wizball* has similar baddies. This really is my main problem here. A lot the ideas that existed pre-Wizball are now useless. No matter what I do, I think, *Repo Ball* will be looked upon as a *Wizball*. This game was designed before *Wizball* was even previewed and I've got proof, so to hell with that theory.

Sunday, 6th December. Didn't wake up.

Monday, 7th December. Found out the reason behind the spurious sprite routine timings and duly jumped out the window. A missing JSR &FFEE caused the raster to mark slightly off the top of the screen and, strangely, I never noticed. Found a way of accelerating the sprite routine and it now plots a 12x16 sprite in 12 pixels of raster time. An amazing feat!

This is a major advance and so I awarded myself the rest of the day off.

Tuesday, 8th December. Interrupt routine

►►

Trogg it 4...
BY TOBY GLOVER....
FOR: A&B 1988!
WELL THEN? YOU'D BETTER START EXPLAININ' YERSELF OR I'LL BE FORCED TO TURN YE INTO SLICED...
OK! OK! WAIT UP!
OUR HERO RACKS HIS BRAIN...
NO! NO MORE! NO... AAARRGH!!
BUT THEN...
NEWS
NEWSFLASH
GOOD EVENING. THIS IS A+B NEWS. ONLY SECONDS AGO, THAT COMIC STRIP WE'VE ALL COME TO KNOW AND LOVE - "TROGG", BECAME VERY SILLY INDEED. THIS TERRIBLE DISASTER COULD MARK THE END OF ONE OF OUR GREATEST STARS - SNIFF - BUT... LET'S BE - SNIFF - STRONG OUT THERE AND - SNIFFLE -... AHEM. THIS IS DAVE REEDER SIGNING OFF.
T. Glover '87

day. Brand new routine and after an hour and a half of fiddling it's perfect. Well, almost. A sound generation caused the raster to bounce so I grabbed a hold of timer 1, pushed the change into the side border and the thing is now rock solid. All my code seems to be on the up these days.

Wednesday, 9th December to Saturday, 12th December. A few sprites drawn and scrapped. Things aren't going too well.

Sunday, 13th December. Off through to Edinburgh to see Dio in concert. Dream Evil tonight.

Monday, 14th December. Heavy duty! My ears are still a bit sensitive from last night's gig but it's pulled me out of a depressive week and I'm back at the keyboard tomorrow. The Chinese street fighter got lucky again today. I'll make him into a curry one of these happy days...

(Your friendly columnist returns...) Dare you wait another month for the next installment? Will the mad Chinese kung fu expert make mincemeat of our hero? Will the well-known terrors of a Glasgow Hogmanay see the end of tight raster control? Will there be tears before bedtime?

Wait till next month, folks, when the next gripping installment of "John Mackay, Pilot of the Keyboard" returns to a magazine near you.

Da dee da da daa!

Mr Nice Guy

You know me, I do my best to please everybody – especially A&B's boy wonder, Clive "your copy is late again, Dave" Grace – but there are times when, despite myself, I can't reveal the dread secrets of the universe that you, the readers, send in.

You know – secrets like infinite life pokes for *Not a Penny More* the day after release. Especially annoying for me (and probably for you) is the time lag I must observe between the release of any games with competitions attached and the complete solutions that I hold in multiple copies.

Take, for example, the recent Superior smasheroo *Codename: Droid* from old Arcade favourites Edmondson and Chamberlain. Even before the game's release I had the promise of a complete solution from the lads themselves but, of course, the Superior mega-competition had to run its course.

Meanwhile, across the land, scores of desperate gamers pleaded for a solution. Okay, here's a compromise. We'll show you screen dumps of the game so you can plot routes but you have to work out how to slip past the baddies, avoid the cunning traps, etc etc.

Sound reasonable? Yes, I thought so.

Preview Time

It's very easy to get blase in this job – every day the postman struggles up my steps with yet another sack of freebie games, acres of paper with all the hints, maps and tips that you could ever wish for, invitations to drunken launches, pleading letters from programmers begging me not to ruin their wretched little lives by slagging off their games (won't work, lads – you forgot the cheques!), and last, but by no means least, a handful of Arcade readers disguised as parcels trying in vain to gain admittance to the largest collection of BBC software in the known universe.

It's hard to be humble in such circumstances but I try. God knows, I try...

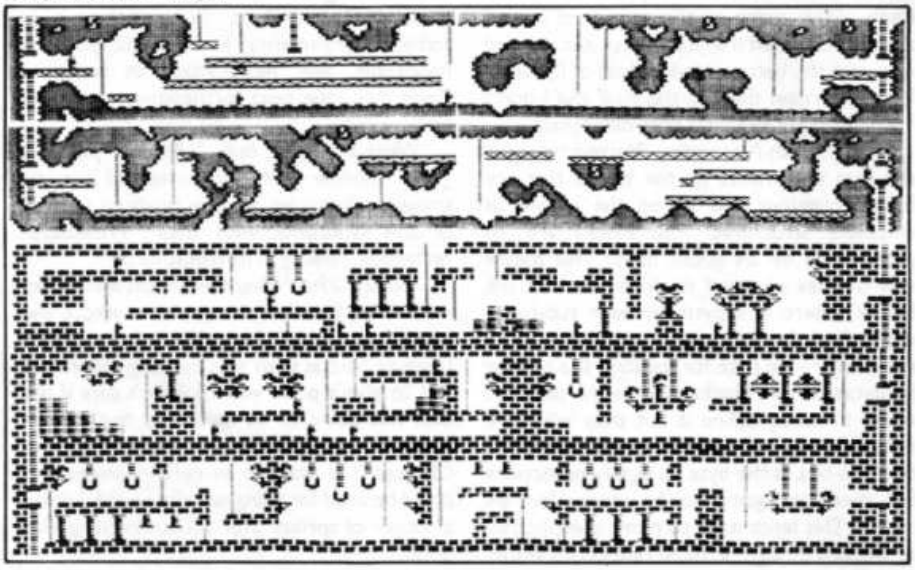
So what can I do when, for example, Darryl Still from Godax/Top Ten asks me pleasantly enough to give him a candid opinion of a new game – *Kourtyard* a first game (we believe) by Mark Rogers – due for budget release in early '88. Well, I do the only thing any professional journalist would do – I phone him up immediately and tell him he's insane!

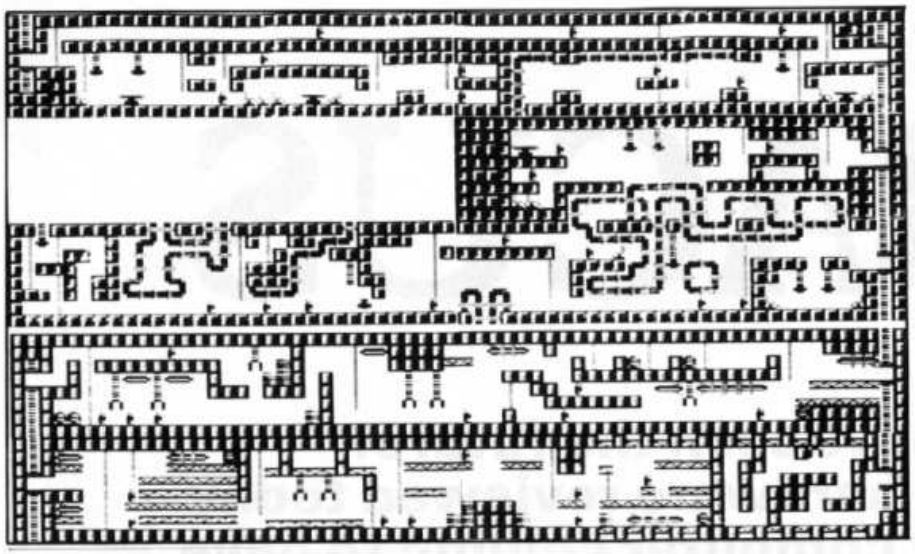
He agrees.

This is a full price game if ever I saw one. I'm really excited by it. So excited in fact that I need to go and have a quick burst of jit jiving to the Bhundu Boys. See you in a minute...

...ah, that's better. Now where were we? Oh yes – this gem of a game. Imagine if you

Codename Droid – Map 1.





Codename Droid – Map 2.

will a Mode 2, eight colour arcade adventure viewed from overhead (like *Ravenskull* as you'll recall). The object? To explore four levels (each about 86 times screen size) in order to find the objects that will restore your kingdom to you. Oh, by the way, did I mention that you are King Arthur?

All you have to do is explore the levels, kill the enemy soldiers, track down the objects, etc etc. So far, so much like a number of other games you could mention.

The difference? The stunning graphics. Take a look at the screen shots? Is that class or is that class? Add to the mixture an editor that allows you to edit any of the four screens and save them for future play and you're looking at an instant classic.

So classic, in fact, that I can't wait for next month – if this isn't Game of the Month then somebody, somewhere has got something mega up their sleeve. Meanwhile, enjoy the anticipation and start saving your pennies. This one is *hot*!

And I'm sorry – it's going to be full price from Godax (£9.95, £11.95 and £14.95 for tape, disc and Master Compact disc) but don't worry. It's going to be worth it.

Hints 'n' Tips Quickies Only, I'm Afraid

Want an easy cheat for *Dunjunz?* Of course you do! On disc version, press <Break> when playing then type MODE2 <Return>, *CODER <Return> and, as if by magic, you'll be transported to the next level.

'Dizzy Sembla' offers the other passwords for *Impossible Mission*. Besides ATOMBEND already revealed in these pages, there are also TERMINAL, RADIATES, DESTROYS and ANRDOIDS.

Ever wondered how those smart alecs find the complete list of *Repton* passwords within about an hour of playing the game? Forget skill; learn low animal cunning instead! For *Repton 3* onwards, load the file you want, press Break and then type **FOR I%=&3000 TO &3200:B%=?I%:IF B% <32 OR B%>126 B%=46:VDUB%:N. ELSE VDU%:N.** The codes then reside in memory &3000-&3200.

Need more energy for the tape version of *Palace of Magic?* Don't we all! Okay: *LOAD POM2, then type in ?&3941=&EA <RET>, ?&3942=&EA <RET> and then CALL &63A0.

Cheat mode for *Krakout!?* Certainly! Pause the game and press at once the letters RUSH. Release pause and <Shift> will cycle you through the screens.

For 255 days with which to complete your quest in *Tarzan*, *LOAD the main program and type ?&40D9=&04. Then CALL &40A0.

For 255 lives in *Gyroscope*, *LOAD the main program, enter PAGE=&6A00, NEW and then RUN this two line program –

```
10P%=&6930:[:LDA#&60:STA&6926:
JSR&6900:LDA#&FF:STA&1951:
JMP&D00:]
20CALL &6930.
```

I really must get together a proper and extensive Hints'n'Tips next time round.

*LOADing Soon

● Not a great deal to report this month, following last issue's major run down of forthcoming software. However:

● Tynesoft are gathering their breath after the marathon multi-machine coding of *Winter Olympiad*. Coming up next should be *Indoor Sports* in January with *Saigon* to follow. Dave Croft is still keen to code *Phantom II* but it looks likely that another sports simulation will take precedence – no firm details at present but this could be the *Classical Olympics* that we've heard rumours of before. However, to keep you quiet until then, Tynesoft are also releasing a *Microvalue Gold* for the Beeb – £3.99 for a tape only package of *Jet Set Willy* and *Ian Botham's Test Match*.

● It's been rumoured. It's been denied. It's been dreamed about. And it's been dreaded by most other software houses. Now it's official – we can expect *Elite II* from Braben and Bell via Superior this year. This will not be a straight repeat, apparently, but will offer some major and unexpected new twists to the game.

● The ASL/Maynard International/Top Ten saga detailed last issue takes a new twist with the announcement of Darryl Still's own label – Godax. Although targetted at the 16 bit market, the company will still release goodies for us thanks to Darryl's excellent connections. Some confusion about which games will come out on which labels but we think Godax will release *Cyboto* by the time you read this, whilst Top Ten will have *Kourtyard* and *Kwangtung* - you'll recall that this last game was the winner of the Arcade search for a new release last year.

● Er, that's about it.

And Finally...

And finally, before I leave you, I present my 1987 Arcade Awards. No prizes, no neato certificates for the wall, no pewter drinking vessels inscribed to the winners, just the thanks of your columnist.

So, contain your excitement and see if you agree:

Software house of the year – a tie here between Superior (again!) and energetic budget rereleasers Alternative, whose seemingly endless £1.99 game releases demonstrated a welcome commitment to the market.

Programmer of the year – Peter Johnson for classy conversion after classy conversion. No hype, no rubbish, just very slick, very polished work.

Game of the year – Arkanoid is the game I've returned to most often.

Disappointment of the year – the lack of serious and dedicated coverage of Beeb games in other computer journals (ha ha! – Assist. Ed).

And finally, a special award for relentless self-promotion goes to ex-ASL lad Darryl Still. Despite a lack of real support from the company (very little advertising, very little desire to hire stands at shows), Darryl did an excellent job of promoting the stream of always interesting ASL releases.

Any comments you care to make agreeing or disagreeing with these choices (or, indeed, anything else) you can send via **Micronet mbx 919999020** or by post to: **Dave Reeder, The Arcade, A&B Computing, ASP Ltd, 1 Golden Square, London W1R 3AB.**

BRYAN RALPH

ABACUS

We have seen the future! Tomorrow's hardware reviewed today – by the only computer column to have successfully mastered time travel!

Some magazines review finished products, others preview products that are partially finished, but only Abacus can bring you an in-depth review of a product that won't be on the market for another 20 years.

The starting point to this extraordinary scoop began when I was flicking through the classified advertisements at the back of a computer magazine. My eye was drawn to a miniscule box which said, "Choose your epoch! Coming soon the Chronoram Epokpod add-on for the BBC. Traverse the ages, see the Siege of Troy, drop into the 21st century – and use no more than 36k of ram. Order now before it's too late."

I 'phoned the contact number and arranged an interview with the advertisers, Orville and Wilbur Norris. My first question when I arrived at their home was, "When will the product be available?"

"Well," said Orville, "It could be anytime now. It could be in the next five minutes or next year."

I admitted to being a little confused.

"The problem," said Wilbur, "is that the technology doesn't exist yet but it could almost instantaneously be available."

I admitted to being even more confused and was ready to write off the Norris Brothers as major league fruit cakes when Wilbur thrust a sheaf of papers under my nose. "Perhaps these will clarify matters," he said. "These messages are from us in the future, they've been turning up all over the house during the past few weeks, all dated and signed between 2002 and 2009. So we know the technology is there. It's only a matter of time before we send back the Epokpod itself and earn millions of pounds here in the present."

"Fair enough," I said, "but shouldn't you already be working on the project so you can bring it all about in 2002?" "You've got a lot to learn about spatio-temporal dynamics," said Wilbur, "besides why should we when it's going to drop into our lap any second?"

There was a knock at the door. "Excuse me," said Orville. A few seconds later he put his head around the door, "Umm Wilbur," he said in a weak voice, "It's Orville and Wilbur." Wilbur rushed out and in the next few minutes I heard the following snatches of conversation.

"What are you doing here?"... "I don't care how much pressure you were under"... "And where's the Epokpod anyway?"... "What do you mean it fell off during lateral time shift manouevres"... "No we can't start all over again"... "But at least there's twice as many of us now to do the work"... "That's what you said the last time we got stuck in this time loop"... "Funny that's what **you** said the last time..."

Wilbur came back into the room sat down and said, "I wonder if you could find room in your magazine for the following message, "Due to circumstances beyond our century the delivery date of the Epokpod has been temporarily delayed!"

The Life and Warped Times of the Norris Brothers

2002 After many years of research, Orville and Wilbur perfect the Chronoram Epokpod add-on for the BBC. In their first test they strap their pet hamster Icarus to the computer, tap in the code and send him three years into the future.

2002-2005 The Norris Brothers potter around the house waiting for Icarus to rematerialise.

2005 Icarus and the computer reappear. The Norris Brothers are so ecstatic they fail to notice slight side effects such as Icarus swelling to three times his normal size and developing psychotic tendencies. Flushed with success, Orville and Wilbur become determined to send a human being to another time. After several months of persuasion, cajoling and blackmail, the little known third Norris Brother, Melvin, volunteers and is despatched into the past. He fails to return at the agreed time a week later and at a press conference Wilbur said, "I could have sworn I wrote down the return code and sellotaped it to the keyboard. Perhaps we may have underestimated the turbulence in the space-time vortex." Orville added, "We believe Melvin is currently living somewhere between the Dark Ages and the Industrial Revolution."

2006 Keen to rectify their mistake Orville and Wilbur try again, this time catapulting their sister Dorothy far into the future. She too failed to come back. "I thought it was Orville's turn to scribble down the return code," Wilbur explained to the press.

2007 Undeterred, but fast running out of siblings to experiment on, the Norris Brothers begin making short hops to nearby decades themselves but not without minor hitches: Orville suffered severe elongation trying to get back from 1991 while Wilbur was temporarily turned inside out during rematerialisation.

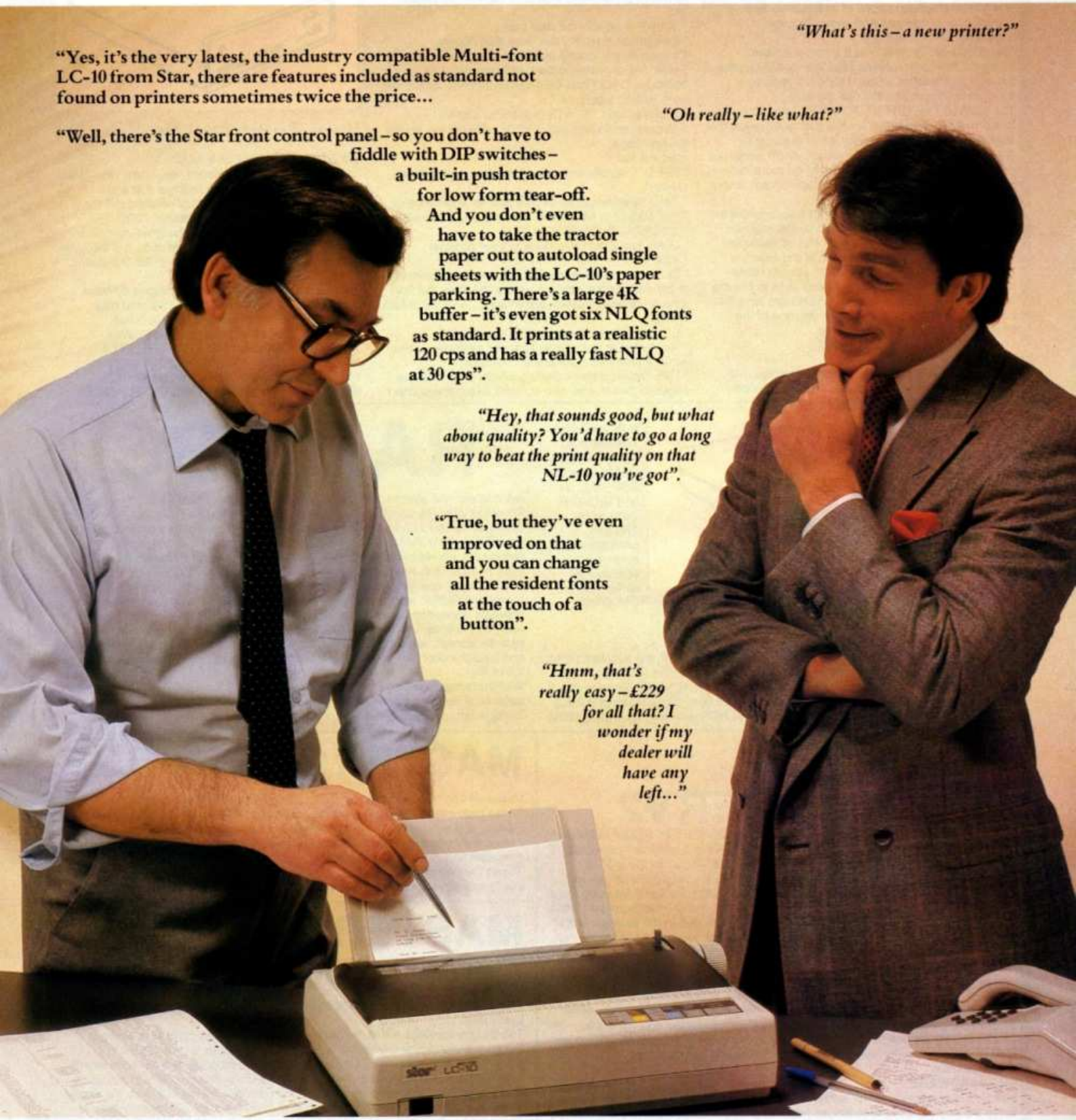
2008 Looking on the bright side, the Norris Brothers refuse to believe the Epokpod is flawed and rush it into production, explaining that "Regretably some people do seem to suffer allergic reactions to time travel." The Chronoram Epokpod is a huge success and revitalises interest in the BBC. However the Epokpod soon picks up the nickname "Broken Boomerang" as more and more users vanish without trace. The Norris Brothers concede that including the return code in the manual could have been helpful. They are besieged by law suits from aggrieved relatives of absentee Epokpod owners.

2009 The Norris Brothers disappear without leaving a forwarding address.

Orville and Wilbur's Three Laws of Time Travel

1. Don't change the course of world history unless you've got a fairly good reason.
2. Try not to become your own grandfather.
3. Don't drop litter in other eras.

"£229 for all that?"


"What's this – a new printer?"
"Yes, it's the very latest, the industry compatible Multi-font LC-10 from Star, there are features included as standard not found on printers sometimes twice the price...
"Oh really – like what?"
"Well, there's the Star front control panel – so you don't have to fiddle with DIP switches – a built-in push tractor for low form tear-off. And you don't even have to take the tractor paper out to autoload single sheets with the LC-10's paper parking. There's a large 4K buffer – it's even got six NLQ fonts as standard. It prints at a realistic 120 cps and has a really fast NLQ at 30 cps".
"Hey, that sounds good, but what about quality? You'd have to go a long way to beat the print quality on that NL-10 you've got".
"True, but they've even improved on that and you can change all the resident fonts at the touch of a button".
"Hmm, that's really easy – £229 for all that? I wonder if my dealer will have any left..."

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The MORLEY TELETEXT ADAPTER introduces you to the world of Teletext at a price that won't break the bank. Inside it you will find the latest in second generation Teletext chip technology, which unlike our rivals who are still using chips designed more than ten years ago, will be fully compatible with any future advances in the Teletext system.
With the Morley adapter you will get a state of the art unit that automatically tunes itself into the required station (no more messing around with screwdrivers or twiddling little knobs in the back of the case), a user friendly menu driven program, easy to follow instructions and a 12 month warranty. Add to this the free downloadable telesoftware and we are sure that you will agree that we are offering you one of the best bargains on the market today.

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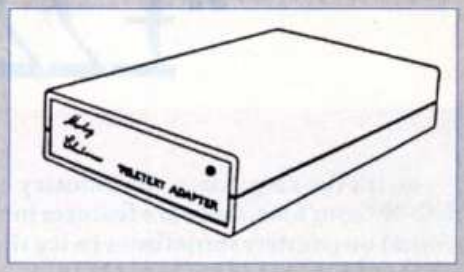
* Easy to follow comprehensive user guides.
* No hardware limitations, it can for example receive virtually unlimited numbers of channels.
* Utils disc available including printer drivers allows pages to be selected and dumped direct to a printer



(no more TV or Radio Times to buy).

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". . .In terms of price, performance, future expansion possibilities and those little touches that show thought for the end user I would recommend the Morley unit."*–(Acorn User, January, 1986).*
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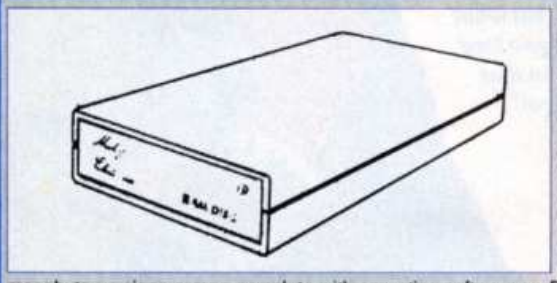
RAMDISC



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FEATURES:
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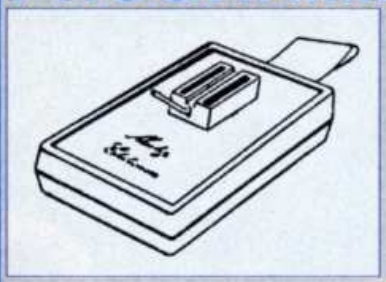
EPROM PROGRAMMER V2



The MORLEY EPROM PROGRAMMER V2 is a small self contained unit that plugs into the BBC or MASTER user port. It comes with a high quality ZIF (zero insertion force socket) and contrasting plastic case. Also included in the package is it's own user friendly menu driven software on ROM or disc.
This state of the art unit, allows programming of 2764 (8k), 27128 (16k), and 27256 (32k) EPROMS. Not only does the hardware allow programming of the usual NMOS devices, but will handle the new generation CMOS equally as well, and with the average time taken to program a 16k at less than 30 seconds we believe it to be one of the fastest programmers available today.

THE HARDWARE
The Unit is completely under software control, there are no knobs or switches to baffle the novice, and the extended features provided should excite the pro's.

THE SOFTWARE
The comprehensive user friendly software included in the package has two main parts, the first allows EPROMS to be read, programmed, verified and edited, also allowing a ROM image to be loaded or saved to disc. The second is a full ROM management system in its own right, which has a host of useful features and routines, such as KILL and RESURRECT ROM to disable or enable a sideways ROM, dump ROM image to buffer or disc, move ROM image in buffer to sideways RAM, and VIEW-SEARCH any sideways ROM.
The whole system is available now for less than the price of one WORDWISE chip. So get yourself the all new MORLEY EPROM PROGRAMMER V2 today and start using those expansion boards for what they were made for! ROMS.
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These high quality Master expansion cartridges will take two 16k sideways ROM's, and will, unlike similar cartridges available from other manufacturers, accept the new second generation programs, such as Computer Concepts Interword and Spellmaster ROM's.
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The **Smart** cartridge will at the press of a button halt any program running in memory and execute any one of a host of useful built in, or user defined procedures, and once completed will return to the program and continue where it left off. The only limiting factor with this device is the programmers imagination.
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Autosaves computer's entire memory.
Freeze program at any point.
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Sound On/Off.

ALL CARTRIDGES COME WITH A 12 MONTH NO QUIBBLE WARRANTY

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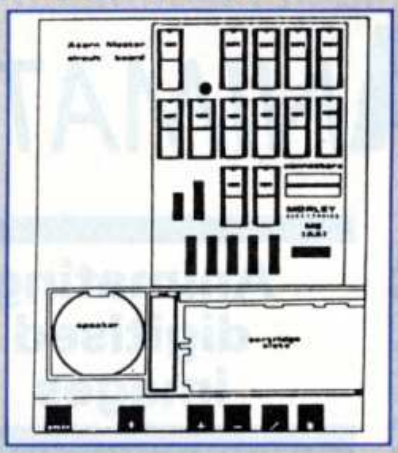
MORLEY MASTER BOARD 'AA'



MORLEY ELECTRONICS

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Philip J Colmer

ANIMATION

Digitising a picture is probably the easiest method of transferring an image into the memory of your BBC computer. Animation has always been tricky on the BBC due to the memory overheads and the time taken to update the image. Techniques to date normally involve using multi-colour modes & colour switching or loading all of the images into main memory & shrinking the screen.

The technique adopted here is, I think, radically different. The physical screen size is not changed – only the size of the picture is. Also, two colour modes (ie 0 & 4) can be used as the animation is achieved by copying the frame data straight into screen memory. The frame data is held in sideways banks, thus limiting the use of main memory to a few zero page locations.

Due to the technique used, several advantages come to light:

1. A sequence can consist of up to 192 frames (12 frames per bank).

2. Each bank is totally autonomous. That is to say that each bank will display its own sequence of frames and then pass control on to the next digitised animation ROM. This means that a sequence can be gradually pieced together without having to re-assemble the entire sequence.

3. By using the event vector, the animation can take place as a background task, thus allowing continued use of the computer (albeit at a reduced speed).

All of the programs access data files and in order to provide maximum flexibility, a prefix string is requested for the source files and the destination files upon running the appropriate programs. These prefixes are literally stuck in front of the created file names. Thus, on a Master, the files can be placed on any filing system by making use of the -temp fs- syntax. In addition, if ADFS is being used, separate path names can be used, thus allowing up to 47 files to be created/retrieved at any one go.

The digitiser used for the exercise was the Watford Beeb Digitiser, although the theory extends, not only to any other digitiser, but also to any sequence of screen shots. The programs use mode 0 for reasons of clarity and ease of compaction. Mode 4 is probably the easiest alternative. The other graphics modes can be used simply by changing the compaction routine. The size of the animation screen needs to remain the same.

The suite

The main menu is a simple one which allows you to select the desired operation by moving the bar up and down with the cursor keys and using RETURN to make the selection.

Animating digitised images

The first stage involved, if you don't already have a sequence of screen shots is to do some digitising. The first program, the frame grabber, is my attempt at a reasonably user-friendly interface to the digitiser. Upon running the program, you will be asked for a destination prefix. The program will then attempt to digitise a frame. You should press SPACE to save the current image or RETURN to leave the program and re-enter the main menu.

Due to the fact that interrupts are disabled while digitising takes place, I would suggest that the space bar is held down while the frame is being digitised if you like the look of the picture and wish to save it. The program will warn you if it cannot find the digitiser ROM or a SYNC pulse. If you manage to fill the disc up or the directory, you will be returned to the main menu.

Having digitised your sequence, it is necessary to squeeze them down to 1/16th of the size of the screen. This is because you cannot hold too many 20K screens in your machine at once and it would take too long to flick between them. With the designated size, each frame takes 1.25K and a small machine code routine can copy each frame to screen memory without you noticing.

The frame squasher asks you for a source and destination prefix and the first and last frame number. By pressing RETURN in response to the last two questions, the program will proceed to squash all of the frames it can find. The process is carried out on-screen so that you know that something is happening. If you press ESCAPE or the program cannot find a particular frame, you will be returned to the main menu.

Having squashed the pictures to a manageable size, it is necessary to combine them in groups of twelve or less. The program will ask you for a source and destination prefix and the range of frames you want combined. If you press RETURN in response to the range questions, all of the frames will be combined. The program will load each of the frames in turn, display them and copy them out to a frame file. If you press ESCAPE or a particular frame cannot be found then you will be returned to the main menu.

After combining the frames, it might be a good idea to see what the sequence looks like. The replay option does just this. It starts by asking you for a source prefix so that it can find the frame files. It then asks for a range of frame files to access. If you press RETURN, all frame files will be displayed in turn.

For maximum speed, the entire file is loaded into memory (at the bottom of the mode 0 screen) and then the individual frames are displayed in the top left corner of the screen. Once all of the frames in the current frame file have been displayed, the next file is loaded in. If it is the last file in the sequence then the sequence is restarted. To return to the main menu, press ESCAPE.

Once you are happy with the frames held in each sequence, you can create the ROMs. The program starts by asking for a ROM title and the delay (in 1/50ths of a second), a source and destination prefix, a range of frame files to access and the initial ROM number. If you answer the range questions with RETURN, all of the frame files found will be converted into ROMs. The initial ROM number determines the first file name used, ie if you answer with 5, then the first file created will be called ROM5. The ROMs are created by loading the frame files into screen memory and assembling the ROM header in front of them and then saving the entire block.

File names used

The package fixes the names of the files used and only by judicious use of the prefixes can you avoid files being overwritten. The names used are:

Pic A full size mode 0 screen **Sqsh** A squashed mode 0 screen **Frames** A frame file **Rom** A fully fledged sideways ROM image

The only concession made is that you can specify the start number used for ROM images. This is so that you can easily compare minor differences such as a different delay.

It is not considered too much of a hardship that the package fixes the file names because the process from digitising the sequence to storing it in ROM is a fairly simple one and automatic filenames make it even simpler.

ROM images

The images are created in the order of animation, ie ROM1 will contain the first twelve frames, ROM2 the next twelve, etc. It is important that ROM1 is in a higher priority bank than ROM2, but they do not have to be in adjacent banks.

The images can be put in EPROMs without any problem. Currently, the ROMs use zero page locations &70 to &76. If this causes a problem with your particular setup, the labels in the program CREATE should be changed appropriately.

The animated sequence can be started by entering mode 0 and typing *A and pressing RETURN. You may now, within certain limits, continue to use your computer, although the speed of it will have dramatically dropped due to the time taken to copy a frame into screen memory.

Technical details

There are two slightly tacky pieces of code in the frame grabber program which need a bit of explanation. The first is the lack of structures around the "grabbing" code. This is because an error caused by *IMAGE not being recognised would clear the REPEAT stack, so I used GOTO! The second is located in the error handler and it reads the error string. This is because the Watford Digitiser ROM uses error code 255 for all of its errors and I wanted to specifically trap the "no sync found" error.

In the frame squasher program, there is a short machine code routine which is used to combine alternate bits from two bytes to form one byte. This was used for speed reasons.

The frame combiner loads a squashed frame into a 1.25k buffer and decodes it into a mode 0 image. The buffer is then output to the frame file by using OSGBPB.

The replay program does the same decoding as the frame combiner, but takes its data from a complete frame file. The decoding is done in BASIC rather than machine code since speed is not too important at this stage.

The ROM header is the heart of the whole system. Since the BBC can have up to 16 ROMs, in theory you can have a digitised sequence with 192 frames in it! In order to provide maximum flexibility, the ROMs are totally independent of each other. This is achieved by implementing a new service call – &FD.

The new service call serves two purposes – it can restart the animation sequence from the beginning and it can pass control of the sequence from one ROM to the next. Strictly speaking, the service call only performs one function. It is by varying the value of the Y register that two actions are achieved.

All service calls are given to the highest priority ROM first. If the call is not claimed (by setting the accumulator to zero) then the call is passed on to the next ROM. This is all done by the operating system. There is an OSBYTE call (*FX143) which allows you to issue service calls.

The action taken by the DARs (digitsed animation ROMs) on receipt of service call &FD is to compare the value in the Y register (the bank number of the current DAR) with its own bank number. If the value of the Y register is LESS THAN OR EQUAL TO its own bank, then the call is passed on. If the value is MORE than it's own bank, then the call is claimed since it must be the next DAR.

Thus, to restart the entire animation sequence, we simply issue service call &FD with a bank number of 16. This will ensure that the highest priority DAR (the first in the sequence) claims it. This is what is done when the service call is not claimed. Since the call has not been claimed, there are no DARs in lower priority sockets than the current DAR – thus the sequence must be restarted.

The "unknown * command" handler (service code 4) was kept simple for space reasons. If required, this could be replaced by a new service call so that instead of doing *A, you could do *FX143,0,<service call>, taking care not to use one already implemented.

Suggested changes

If you are using the Watford Digitiser, you might like to change the *LOAD and *SAVE in the frame grabber and squasher to *IMLOAD and *IMSAVE. This will allow you to hold more images on a disc.

Currently, the DARs only work in mode 0. By digitising frames in modes 1 or 2, the machine code in the DARs could remain the same, only the compression routine would have to change. In order to get the DARs to work in mode 4, you could use mode 0 pictures and change the adding of &1E0 to &A0. Perhaps a lookup table could be used so that this is done automatically when you change mode.

The DARs also take into account the start of screen memory. This allows the screen to scroll (at not too fast a pace – try it and see!) while keeping the image in the top left hand corner of the screen. If you know that the screen is not going to scroll or you want to put the animation elsewhere on the screen, change the initialisation of the "to" vector (it is currently set to a copy of &350/&351). Unfortunately, they do not do a very good job of taking into account the size of the screen memory. If the calculated address exceeds &7FFF then &5000 is subtracted. This is correct for 20k modes only. It should be possible to put some code in to make it more general (see comment at end of previous paragraph).

As mentioned above, the DARs use a few zero page locations. They are used for basically two reasons – values for the duration of a frame copy and values for the duration of a DARs life (ie while it is the active DAR). The impact of using the locations for the first category could be eliminated by putting the original values on the stack and restoring them after the frame had been copied. The impact of using the locations for the second category could be eliminated by storing the values in sideways RAM – but then you could not put the DARs into EPROMs. A possible alternative would be to do something dirty like using the cassette workspace in page 3.

Conclusions

I believe that the techniques used open up at least two possibilities:

1. ROM images that work together through service calls – perhaps a spelling checker ?

2. High speed animation without grabbing too much user memory and totally TUBE compatible.

Perhaps you can think of some others?

♦ LISTING 1 ♦

```
L. (A77E)
   10REM Digitised Animation (
11A6)
   20REM Grab frames (DB28)
   30REM (461C)
   40REM Copyright (c) ASP 198
8 (AFA3)
   50REM (9EF1)
   60ON ERROR PROCerror:GOTO E
RL (0507)
   70MODE 0 (0C7B)
   80PRINTTAB(23,0);"Digitised
 Animation - Grab frames" (6E7
0)
   90PRINTTAB(29,1);"Copyright
 (c) Fil, 1987" (B046)
  100INPUT LINE'"Destination p
refix: "dp$ (9B65)
  110VDU23,1,0;0;0;0; (4194)
  120f%=1 (F481)
  130CLS:PRINT"Looking for fra
me ";f% (934D)
  140PRINT'"Press SPACE to sav
e, RETURN to finish" (98F6)
  150*IMAGE (1F4E)
  160b%=INKEY(10) (68BD)
  170IFb%=-1 GOTO150 (99F5)
  180IFb%=32 OSCLI"SAVE "+dp$+
"Pic"+STR$(f%)+" 3000 8000":f%
=f%+1 (7B53)
  190*FX21,0 (6A4E)
  200IFb%<>13 GOTO130 (D6D0)
  210PROCexit (667B)
  220END (EC03)
  230: (DD65)
  240DEFPROCerror (408E)
  250LOCAL p%,e$ (FF0E)
  260p%=(!&FD AND &FFFF)+1 (8E
3B)
  270e$="" (A3E3)
  280REPEAT (6A35)
  290 e$=e$+CHR$(?p%) (A409)
  300 p%=p%+1 (F8E6)
  310UNTIL?p%=0 (741C)
  320IFe$=" No Sync Input Foun
d " PROCerr(e$):ENDPROC (49A6)
  330IFERR=198 PROCerr(" No Mo
re Space On This Disc "):PROCe
xit (3D06)
  340IFERR=17 PROCerr(" Exit R
equested "):PROCexit (9D90)
  350IFERR=254 PROCerr(" No Di
gitiser ROM Installed "):PROCe
xit (ED09)
  360CLS (BFD2)
  370REPORT:PRINT" (";ERR;") a
t line ";ERL (EE74)
  380END (8097)
  390: (E0B6)
  400DEFPROCerr(e$) (C732)
  410LOCAL x% (266F)
  420x%=40-LEN(e$)DIV2 (B490)
  430VDU7 (3E3B)
  440COLOUR 135 (2D38)
  450COLOUR 0 (DA07)
  460PRINTTAB(x%,30);e$ (33A7)
  470TIME=0:REPEAT UNTIL TIME>
200 (B72A)
  480COLOUR128 (F99B)
  490PRINTTAB(x%,30);e$ (03CE)
```

```
  500COLOUR7 (7DAA)
  510ENDPROC (52C7)
  520: (989E)
  530DEFPROCexit (5F74)
  540*DIR :0.$ (D29D)
  550CHAIN"Menu" (D27A)
  560ENDPROC (B6F1)
>
```

♦ LISTING2 ♦

```
L. (A77E)
   10REM Digitised Animation (
11A6)
   20REM Combine frames (D606)
   30REM (461C)
   40REM Copyright (c) ASP 198
8 (AFA3)
   50REM (9EF1)
   60ON ERROR PROCerror (4CDE)
   70MODE 0:DIM buffer &500 (6
D63)
   80PRINTTAB(23,0);"Digitised
 Animation - Combine frames" (
BCA9)
   90PRINTTAB(29,1);"Copyright
 (c) Fil, 1987" (B046)
  100INPUT LINE'"Source prefix
: "sp$ (8B12)
  110INPUT LINE'"Destination p
refix: "dp$ (F741)
  120INPUT LINE'"Start frame (
RETURN for first): "sf$ (B7CB)
  130INPUT LINE'"End frame (RE
TURN for last): "ef$ (8566)
  140VDU12,23,1,0;0;0;0; (8759
)
  150IF(sf$="")OR(VAL(sf$)=0)
sf$="1" (6B1E)
  160IF(ef$="")OR(VAL(ef$)=0)
ef$="32767" (473F)
  170f%=VAL(sf$):exit%=FALSE:f
rame_count%=12:file_count%=0 (
BB2A)
  180REPEAT (A8DC)
  190 f$=sp$+"Sqsh"+STR$(f%) (
0EED)
  200 VDU31,40,0:PRINTSTRING$(
40," ") (9661)
  210 VDU31,40,0:PRINT"Frame "
;f$ (7E25)
  220 IFFNfile(f$) PROCdisplay
_and_copy(f$) ELSE exit%=TRUE
(E08A)
  230 f%=f%+1:IFf%>VAL(ef$) ex
it%=TRUE (700B)
  240UNTILexit% (4342)
  250PROCexit (F19D)
  260END (7CB5)
  270: (98E6)
  280DEFFNfile(f$) (CB1C)
  290LOCAL c% (6526)
  300c%=OPENIN(f$):IFc%<>0 CLO
SE#0 (7BB8)
  310=(c%<>0) (F446)
  320: (8020)
  330DEFPROCdisplay_and_copy(f
$) (890A)
  340LOCAL count,count1,from,t
o (22A9)
  350OSCLI"LOAD "+f$+" "+STR$~
(buffer) (2E20)
  360to=&3000:from=buffer (38B
1)
  370FORcount=0TO7 (8864)
  380 FORcount1=1TO40 (3AB3)
  390  !to=!from:to=to+4:from=
from+4 (E358)
  400 NEXT (A152)
  410 to=to+&1E0 (8438)
  420NEXT (EA92)
  430PROCcopy (D623)
  440ENDPROC (8067)
  450: (32B8)
  460DEFPROCcopy (C309)
  470LOCAL chan% (474F)
  480frame_count%=frame_count%
+1 (67CA)
  490IFframe_count%=13 frame_c
ount%=1:file_count%=file_count
%+1:PROCcreate (B5EE)
  500PRINTTAB(40,1);"Updating
"+dp$+"Frames"+STR$(file_count
%) (C2E7)
  510chan%=OPENUP(dp$+"Frames"
+STR$(file_count%)) (641D)
  520IFchan%=0 PROCerr(" Unabl
e To Write To Frame File "):PR
OCexit (91C6)
  530?&70=chan% (1052)
  540!&71=buffer (4044)
  550!&75=&500 (0B83)
  560!&79=&500*(frame_count%-1
) (433E)
  570A%=1:X%=&70:Y%=0:CALL&FFD
1:REM OSGBPB (DE80)
  580CLOSE#chan% (3275)
  590PRINTTAB(40,1);STRING$(40
," ") (F214)
  600ENDPROC (ED4B)
  610: (7F51)
  620DEFPROCcreate (AF02)
  630LOCAL chan% (7BBE)
  640PRINTTAB(40,1);"Creating
"+dp$+"Frames"+STR$(file_count
%) (45AF)
  650chan%=OPENOUT(dp$+"Frames
"+STR$(file_count%)) (AA78)
  660IFchan%=0 PROCerr(" Unabl
e To Create To Frame File "):P
ROCexit (4B70)
  670PTR#chan%=&100 (DFF4)
  680CLOSE#chan% (B59E)
  690PRINTTAB(40,1);STRING$(40
," ") (AF78)
  700ENDPROC (5893)
  710: (7B64)
  720DEFPROCerror (DF1A)
  730IFERR=17 PROCerr(" Exit R
equested "):PROCexit (D162)
  740CLS (6009)
  750REPORT:PRINT" (";ERR;") a
t line ";ERL (CDC5)
  760END (CED5)
  770: (8C07)
  780DEFPROCerr(e$) (AF10)
  790LOCAL x% (7B46)
  800x%=40-LEN(e$)DIV2 (A8A7)
  810VDU7 (B520)
  820COLOUR 135 (46AB)
  830COLOUR 0 (6CC9)
  840PRINTTAB(x%,30);e$ (E346)
  850TIME=0:REPEAT UNTIL TIME>
200 (0C3A)
  860COLOUR128 (126F)
  870PRINTTAB(x%,30);e$ (0C9A)
  880COLOUR7 (1DA5)
  890ENDPROC (32C8)
  900: (1B02)
  910DEFPROCexit (F35E)
  920*DIR :0.$ (75FB)
  930CHAIN"Menu" (B813)
  940ENDPROC (ADD6)
>
```

♦ LISTING3 ♦

```
L. (A77E)
   10REM Digitised Animation (
11A6)
   20REM Create ROMs (675E)
   30REM (461C)
   40REM Copyright (c) ASP 198
8 (AFA3)
   50REM (9EF1)
   60ON ERROR PROCerror (4CDE)
   70MODE 0 (0C7B)
   80max_frame_size=12*&500 (7
27D)
   90rom_size=&4000 (9E4E)
  100data_start=(&8000+rom_siz
e)-max_frame_size (DDAA)
  110buffer=&8000-rom_size (3B
30)
  120data_load=(buffer+rom_siz
e)-max_frame_size (8DE3)
  130PROCc(0,"Digitised Animat
ion - Create ROMs") (3BE2)
  140PROCc(1,"Copyright (c) Fi
l, 1987") (83B3)
  150INPUT LINE'"Rom title: "t
$ (441E)
  160INPUT LINE'"Delay between
 frames: "d$ (AF4B)
  170INPUT LINE'"Source prefix
: "sp$ (E52F)
  180INPUT LINE'"Destination p
refix: "dp$ (9A80)
  190INPUT LINE'"Start frame f
ile (RETURN for first): "sf$ (
F0BB)
  200INPUT LINE'"End frame fil
e (RETURN for last): "ef$ (D9F
A)
  210INPUT LINE'"Start ROM fil
e (RETURN for 1): "sr$ (D188)
  220VDU12,23,1,0;0;0;0; (0152
)
  230IF(sf$="")OR(VAL(sf$)=0)
sf$="1" (63B7)
  240IF(ef$="")OR(VAL(ef$)=0)
ef$="32767" (DA97)
  250IF(sr$="")OR(VAL(sr$)=0)
sr$="1" (8B40)
  260delay%=VAL(d$) (267F)
  270rom%=VAL(sr$) (CBA4)
  280frame%=VAL(sf$) (0E19)
  290exit%=FALSE (4136)
  300REPEAT (DCA4)
  310 PRINTTAB(0,0);"Creating
ROM ";rom% (92CC)
  320 f$=sp$+"Frames"+STR$(fra
me%) (77DE)
  330 IFFNfile(f$) PROCload an
d_asm(f$) ELSE exit%=TRUE (20F
9)
  340 frame%=frame%+1:IFframe%
>VAL(ef$) exit%=TRUE (C716)
  350 rom%=rom%+1 (9355)
  360UNTILexit% (3A31)
  370PROCexit (6BCD)
  380END (8097)
  390: (E0B6)
  400DEFPROCc(y%,s$) (51F0)
  410PRINTTAB(40-LEN(s$)DIV2,y
%);s$ (F8EC)
  420ENDPROC (25F6)
  430: (C5DB)
  440DEFFNfile(f$) (7A2A)
  450LOCAL c% (5803)
  460c%=OPENIN(f$):IFc%<>0 CLO
SE#c% (6F55)
  470=(c%<>0) (5CBC)
```

```
  480: (A54D)
  490DEFPROCload_and_asm(f$) (
63C0)
  500LOCAL chan%,I% (0C06)
  510chan%=OPENIN(f$):no_frame
s%=EXT#chan%/&500:CLOSE#chan%
(3F35)
  520PRINTTAB(0,1);no_frames%;
" frames present" (C3EF)
  530OSCLI"LOAD "+f$+" "+STR$~
(data_load) (581D)
  540REM (BB17)
  550REM memory used by DARs i
s as follows: (9CC7)
  560from   = &70:REM pointer
to digitised data in ROM (933F
)
  570to     = &72:REM pointer
to screen memory (9B0C)
  580count  = &74:REM temporar
y counter (8F1B)
  590pcount = &75:REM picture
counter for this ROM (510A)
  600delay  = &76:REM in 1/50t
hs of a second (5D89)
  610FOR I%=4 TO 6 STEP 2 (2B7
2)
  620P%=&8000 (AA95)
  630O%=buffer (784D)
  640[OPT I% (8B6F)
  650BRK:BRK:BRK (F57D)
  660JMP service (B693)
  670EQUB &82 (6908)
  680EQUB copyright-&8000 (07F
D)
  690EQUB 0 (38C5)
  700EQUS t$+" "+STR$~(no_fram
es%)+" "+STR$~(delay%) (DE66)
  710.copyright (E489)
  720EQUB 0 (754E)
  730EQUS "(C) Fil, 1987" (216
7)
  740EQUB 0 (A339)
  750.service (2E45)
  760CMP #4 (AD0A)
  770BEQ service_4 (4203)
  780\ A special service code
is implemented: (9A69)
  790\ &FD selects the first D
AR below the one specified by
Y (DFD1)
  800CMP #&FD (6C5A)
  810BEQ service_FD (46BB)
  820RTS (B645)
  830.service_4 (EC98)
  840PHA:TYA:PHA (9A7E)
  850LDA (&F2),Y:CMP #ASC"A":B
NE not_mine (4E1D)
  860INY:LDA (&F2),Y:CMP #13:B
NE not_mine (D357)
  870PLA:PLA (1260)
  880\ claim vector (4741)
  890LDA #&30:STA &220:LDA #&F
F:STA &221 (B2AF)
  900LDA #143:LDX #&FD:LDY #16
:JSR &FFF4 \ select first DAR
(F406)
  910LDA #14:LDX #4:JSR &FFF4
\ enable events (BB7C)
  920LDA #0:RTS (D7AA)
  930\ not correct * command f
or this ROM (195D)
  940.not_mine (6A6C)
  950PLA:TAY:PLA:RTS (09F5)
  960.service_FD (38E5)
  970CPY &F4:BEQ service_FD_ex
:BCC service_FD_ex (DD20)
  980\ select ROM for processi
ng animation (6F49)
  990LDA #event MOD 256:STA &D
CF (250B)
 1000LDA #event DIV 256:STA &D
D0 (8233)
 1010LDY &F4:STY &DD1 (BE15)
 1020LDA num_pictures:STA pcou
nt (583E)
 1030LDA this_delay:STA delay
(D366)
 1040LDA #data_start MOD 256:S
TA from (3E9E)
 1050LDA #data_start DIV 256:S
TA from+1 (0DD2)
 1060LDA #0 \ claim service co
de (2B66)
 1070.service_FD_ex (8AD4)
 1080RTS (5BF8)
 1090.event (3B30)
 1100PHA:TXA:PHA:TYA:PHA (6075
)
 1110DEC delay:BNE skip_reset
(54FC)
 1120LDA this_delay:STA delay
(A389)
 1130LDA &350:STA to \ change
this to put the image elsewher
e (94DF)
 1140LDA &351:STA to+1 (7870)
 1150LDY #0 (802A)
 1160LDX #7 (9ECC)
 1170\ (5C2A)
 1180.copy (279C)
 1190LDA #160:STA count (072A)
 1200\ (FE66)
 1210.copy_0 (3730)
 1220LDA (from),Y:STA (to),Y (
190A)
 1230INC from:BNE copy_1:INC f
rom+1 (3AA5)
 1240.copy_1 (700B)
 1250INC to:BNE copy_2:INC to+
1 (E5BB)
 1260.copy_2 (9380)
 1270DEC count:BNE copy_0 (01D
B)
 1280CLC:LDA #&E0:ADC to:STA t
o \ change this for smaller sc
reens (96F3)
 1290LDA #1:ADC to+1:STA to+1
(7A71)
 1300BPL copy_3 (5E9F)
 1310\ exceeded screen memory
- reset pointer (096D)
 1320SEC:SBC #&50:STA to+1 \ &
50 for 20K screens only (542D)
 1330.copy_3 (6163)
 1340DEX:BPL copy (FD60)
 1350\ picture completed - hav
e we finished with this ROM ?
(3460)
 1360DEC pcount:BNE skip_reset
(012F)
 1370LDA #143:LDX #&FD:LDY &F4
:JSR &FFF4 \ look for next ROM
(062F)
 1380CPY &F4:BNE skip_reset \
ok - next ROM found (6395)
 1390\ no lower ROM so issue r
eset service code (C54D)
 1400LDA #143:LDX #&FD:LDY #16
:JSR &FFF4 (8FF3)
 1410.skip_reset (C49A)
 1420PLA:TAY:PLA:TAX:PLA:RTS (
B397)
 1430.num_pictures (A0A7)
 1440EQUB no_frames% (5DB4)
 1450.this_delay (D253)
 1460EQUB delay% (A19F)
 1470] (6888)
 1480NEXT (8AD5)
 1490OSCLI"SAVE "+dp$+"Rom"+ST
R$(rom%)+" "+STR$~(buffer)+"+4
000 8000 8000" (4EB9)
 1500ENDPROC (49EC)
 1510: (C1E0)
 1520DEFPROCerror (BC98)
 1530IFERR=17 PROCerr(" Exit R
equested "):PROCexit (461A)
 1540CLS (8043)
 1550REPORT:PRINT" (";ERR;") a
t line ";ERL (70AC)
 1560END (2E9F)
 1570: (3683)
 1580DEFPROCerr(e$) (E925)
 1590LOCAL x% (60B3)
 1600x%=40-LEN(e$)DIV2 (D4ED)
 1610VDU7 (E13A)
 1620COLOUR 135 (FE9F)
 1630COLOUR 0 (1DE7)
 1640PRINTTAB(x%,30);e$ (F550)
 1650TIME=0:REPEAT UNTIL TIME>
200 (F1DC)
 1660COLOUR128 (E36D)
 1670PRINTTAB(x%,30);e$ (1A8C)
 1680COLOUR7 (94B3)
 1690ENDPROC (BBDE)
 1700: (90FA)
 1710DEFPROCexit (4DE9)
 1720*DIR :0.$ (84F9)
 1730CHAIN"Menu" (06A4)
 1740ENDPROC (24C0)
>
```

♦ LISTING 4 ♦

```
L. (A77E)
   10REM Digitised Animation (
11A6)
   20REM Main Menu (7C10)
   30REM (461C)
   40REM Copyright (c) ASP 198
8 (AFA3)
   50REM (9EF1)
   60MODE 7:max%=6 (E713)
   70DIM m$(max%) (E737)
   80m$(1)="Grab frames" (2CE4
)
   90m$(2)="Squash frames" (A0
CC)
  100m$(3)="Combine frames" (B
36E)
  110m$(4)="Replay frames" (54
2D)
  120m$(5)="Create ROMs" (50C0
)
  130m$(6)="Exit" (FF86)
  140PROCcentre("Digitised Ani
mation",0,TRUE,131) (3A3E)
  150PROCcentre("Copyright (c)
 Fil, 1987",3,FALSE,134) (3966
)
  160PROCcentre("Use cursor up
/down & RETURN to select",23,F
ALSE,134) (AB3F)
  170VDU23,1,0;0;0;0;:opt%=1:*
FX4,1 (92EF)
  180REPEAT (A8DC)
  190 FORi%=1TOmax% (E97A)
  200  IFi%=opt% PROCmenu(132,
157,i%) ELSE PROCmenu(156,156,
i%) (AB9D)
  210 NEXT (74FE)
  220 i%=GET (1ABD)
  230 IFi%=139 opt%=opt%-1:IFo
pt%=0 opt%=max% (D98A)
  240 IFi%=138 opt%=opt%+1:IFo
pt%=max%+1 opt%=1 (FFC2)
```

▶▶

```
  250UNTILi%=13 (A310)
  260IFopt%=1 CHAIN"Grab" (4D1
1)
  270IFopt%=2 CHAIN"Squash" (A
795)
  280IFopt%=3 CHAIN"Combine" (
6AAD)
  290IFopt%=4 CHAIN"Replay" (0
B35)
  300IFopt%=5 CHAIN"Create" (5
6D9)
  310VDU12,23,1,1;0;0;0;:*FX4,
0 (D915)
  320END (C9E3)
  330: (D950)
  340DEFPROCcentre(a$,y%,d%,c%
) (3EE4)
  350LOCAL x%,i%,n% (9E46)
  360x%=18-LEN(a$)DIV2 (F26A)
  370IFd% n%=2 ELSE n%=1:x%=x%
+1 (787A)
  380FORi%=1TOn% (20AE)
  390VDU31,x%,y%+i%-1,c% (F876
)
  400IFd% VDU141 (2E8F)
  410PRINTa$ (5EF3)
  420NEXT (EA92)
  430ENDPROC (6451)
  440: (6BC8)
  450DEFPROCmenu(c1%,c2%,i%) (
DD06)
  460LOCAL x%,a$,y% (92C4)
  470y%=5+i%*2 (B75B)
  480a$=CHR$(c1%)+CHR$(c2%)+CH
R$(131)+m$(i%)+"  "+CHR$(156)
(3B39)
  490x%=20-LEN(a$)DIV2 (17C2)
  500VDU31,x%,y% (8536)
  510PRINTa$ (EB2B)
  520ENDPROC (902E)
>
```

♦ LISTING 5 ♦

```
L. (A77E)
   10REM Digitised Animation (
11A6)
   20REM Squash frames (9A43)
   30REM (461C)
   40REM Copyright (c) ASP 198
8 (AFA3)
   50REM (9EF1)
   60ON ERROR PROCerror (4CDE)
   70MODE 0:PROCasm (C6A8)
   80PRINTTAB(23,0);"Digitised
 Animation - Squash frames" (1
EE4)
   90PRINTTAB(29,1);"Copyright
 (c) Fil, 1987" (B046)
  100INPUT LINE'"Source prefix
: "sp$ (8B12)
  110INPUT LINE'"Destination p
refix: "dp$ (F741)
  120INPUT LINE'"Start frame (
RETURN for first): "sf$ (B7CB)
  130INPUT LINE'"End frame (RE
TURN for last): "ef$ (8566)
  140VDU23,1,0;0;0;0; (4312)
  150IF(sf$="")OR(VAL(sf$)=0)
sf$="1" (6B1E)
  160IF(ef$="")OR(VAL(ef$)=0)
ef$="32767" (473F)
  170f%=VAL(sf$) (4244)
  180REPEAT (A8DC)
  190 f$=sp$+"Pic"+STR$(f%) (A
379)
  200 VDU12,31,0,0 (6703)
  210 PRINT"Looking for frame
"+f$ (0B09)
  220 IFFNfile(f$) PROCsquash(
f$) (E459)
  230 f%=f%+1 (0512)
  240UNTIL(c%=0)OR(f%>VAL(ef$)
) (4813)
  250PROCexit (F19D)
  260END (7CB5)
  270: (98E6)
  280DEFFNfile(f$) (CB1C)
  290LOCAL c% (6526)
  300c%=OPENIN(f$):IFc%<>0 CLO
SE#c% (40C0)
  310=(c%<>0) (F446)
  320: (8020)
  330DEFPROCsquash(f$) (C188)
  340OSCLI"LOAD "+f$+" 3000" (
AFC4)
  350PROCvert (2701)
  360PROChori (5D28)
  370f$=dp$+"Sqsh"+STR$(f%) (0
40C)
  380c%=OPENOUT(f$):IFc%<>0 PR
OCsave(c%) (3FF2)
  390CLOSE#0 (48F2)
  400ENDPROC (A6B8)
  410: (773B)
  420DEFPROCvert (5C92)
  430LOCAL Y%,S%,D%,X% (5FB8)
  440FORY%=1 TO 63 (1888)
  450S%=&3000+640*((Y%*4)DIV8)
+(Y%*4)MOD8 (E656)
  460D%=&3000+640*(Y%DIV8)+Y%M
OD8 (0E90)
  470FOR X%=0 TO 632 STEP 8 (C
2AF)
  480X%?D%=X%?S% (BB6B)
  490NEXT (8BF1)
  500NEXT (6971)
  510ENDPROC (52C7)
  520: (989E)
  530DEFPROChori (DC49)
  540LOCAL D%,I%,J%,s%,b1%,b2%
 (A02B)
  550FOR D%=0 TO 7 (2294)
  560 FOR I%=0 TO 7 (67AD)
  570  s%=&3000+I%+D%*&280 (60
2D)
  580  FOR J%=0 TO 19 (9C6D)
  590   b1%=FNcombine(s%?(J%*3
2),s%?(J%*32+8)) (2904)
  600   b2%=FNcombine(s%?(J%*3
2+16),s%?(J%*32+24)) (07B2)
  610   s%?(J%*8)=FNcombine(b1
%,b2%) (C79A)
  620  NEXT (5A97)
  630 NEXT (7F77)
  640NEXT (86D7)
  650ENDPROC (8A33)
  660: (D142)
  670DEFFNcombine(b1%,b2%) (EC
CE)
  680?byte_1=b1%:?byte_2=b2%:C
ALL&900:=?result (DD94)
  690: (F457)
  700DEFPROCsave(c%) (401C)
  710LOCAL i%,j%,l% (C78B)
  720l%=&3000 (A85E)
  730FORj%=0TO7 (6164)
  740FORi%=0TO159 (C8C1)
  750BPUT#c%,?l% (DED1)
  760l%=l%+1 (5901)
  770NEXT (20D4)
  780l%=l%+&1E0 (F155)
  790NEXT (F3D7)
  800ENDPROC (3ED1)
  810: (4647)
  820DEFPROCasm (F618)
  830REM Assemble m/c routine
to combine two bytes (F1E4)
  840LOCAL I% (AA5F)
  850byte_1=&80 (950E)
  860byte_2=&81 (D9B1)
  870result=&82 (FBF6)
  880FOR I%=0 TO 2 STEP 2 (CAE
4)
  890P%=&900 (007B)
  900[OPT I% (CBF2)
  910LDA #0 (400D)
  920STA result (658D)
  930LDA byte_1 (53EA)
  940JSR shift (3083)
  950LDA byte_2 (323A)
  960.shift (28FE)
  970ASL A (7A89)
  980ROL result (1D1A)
  990LDX #3 (B133)
 1000.loop (6E3C)
 1010ASL A (E765)
 1020ASL A (9F43)
 1030ROL result (7A8A)
 1040DEX (8628)
 1050BNE loop (1C24)
 1060RTS (823A)
 1070] (785C)
 1080NEXT (CA9C)
 1090ENDPROC (67CB)
 1100: (8844)
 1110DEFPROCerror (AE27)
 1120IFERR=198 PROCerr(" No Mo
re Space On This Disc "):PROCe
xit (240D)
 1130IFERR=17 PROCerr(" Exit R
equested "):PROCexit (8FFB)
 1140CLS (17C3)
 1150REPORT:PRINT" (";ERR;") a
t line ";ERL (2A5D)
 1160END (B91F)
 1170: (2657)
 1180DEFPROCerr(e$) (B432)
 1190LOCAL x% (46FA)
 1200x%=40-LEN(e$)DIV2 (9E7E)
 1210VDU7 (A173)
 1220COLOUR 135 (38DC)
 1230COLOUR 0 (3BAE)
 1240PRINTTAB(x%,30);e$ (3616)
 1250TIME=0:REPEAT UNTIL TIME>
200 (0398)
 1260COLOUR128 (E28B)
 1270PRINTTAB(x%,30);e$ (D9CA)
 1280COLOUR7 (0355)
 1290ENDPROC (2C38)
 1300: (802E)
 1310DEFPROCexit (98CE)
 1320*DIR :0.$ (851F)
 1330CHAIN"Menu" (D383)
 1340ENDPROC (B326)
>
```

♦ LISTING 6 ♦

```
L. (A77E)
   10REM Digitised Animation (
11A6)
   20REM Replay frames (BF0D)
   30REM (461C)
   40REM Copyright (c) ASP 198
8 (AFA3)
   50REM (9EF1)
   60ON ERROR PROCerror (4CDE)
   70MODE 0:buffer=&8000-12*&5
00 (0AA5)
   80PRINTTAB(23,0);"Digitised
 Animation - Replay frames" (7
8C7)
   90PRINTTAB(29,1);"Copyright
```

```
 (c) Fil, 1987" (B046)
  100INPUT LINE'"Source prefix
: "sp$ (8B12)
  110INPUT LINE'"Start frame f
ile (RETURN for first): "sf$ (
119F)
  120INPUT LINE'"End frame fil
e (RETURN for last): "ef$ (BC8
1)
  130VDU12,23,1,0;0;0;0; (854C
)
  140IF(sf$="")OR(VAL(sf$)=0)
sf$="1" (1C09)
  150IF(ef$="")OR(VAL(ef$)=0)
ef$="32767" (F353)
  160REPEAT (899D)
  170 f%=VAL(sf$):exit%=FALSE
(A782)
  180 REPEAT (A8DC)
  190  f$=sp$+"Frames"+STR$(f%
) (0FF7)
  200  VDU31,40,0:PRINTSTRING$
(40," ") (9661)
  210  VDU31,40,0:PRINT"Frame
file ";f$ (43A8)
  220  IFFNfile(f$) PROCdispla
y(f$) ELSE exit%=TRUE (1C25)
  230  f%=f%+1 (0512)
  240 UNTIL(exit%)OR(f%>VAL(ef
$)) (41CA)
  250 IFexit% ef$=STR$(f%-2) (
BCE3)
  260UNTILFALSE (AC01)
  270END (C8B9)
  280: (BDF3)
  290DEFFNfile(f$) (EE49)
  300LOCAL c% (0ED2)
  310c%=OPENIN(f$):IFc%<>0 CLO
SE#0 (4729)
  320=(c%<>0) (0A6D)
  330: (D950)
  340DEFPROCdisplay(f$) (73EE)
  350LOCAL count%,count1%,coun
t2%,from%,to%,chan%,frames% (6
8B6)
  360chan%=OPENIN(f$):frames%=
EXT#chan%/&500:CLOSE#chan% (4C
A2)
  370OSCLI"LOAD "+f$+" "+STR$~
(buffer) (3D30)
  380from%=buffer (09E9)
  390FORcount%=1TOframes% (237
F)
  400 to%=&3000 (6EBF)
  410 FORcount1%=0TO7 (44B0)
  420  FORcount2%=1TO40 (FE2E)
  430   !to%=!from%:to%=to%+4:
from%=from%+4 (6614)
  440  NEXT (36D2)
  450  to%=to%+&1E0 (EA5A)
  460 NEXT (7D12)
  470NEXT (58F2)
  480ENDPROC (EB06)
  490: (FC3D)
  500DEFPROCerror (6F02)
  510IFERR=17 PROCerr(" Exit R
equested "):PROCexit (2BA4)
  520CLS (F324)
  530REPORT:PRINT" (";ERR;") a
t line ";ERL (FB5C)
  540END (CD4E)
  550: (368D)
  560DEFPROCerr(e$) (B6EE)
  570LOCAL x% (2BD9)
  580x%=40-LEN(e$)DIV2 (436B)
  590VDU7 (B29B)
  600COLOUR 135 (DFDE)
  610COLOUR 0 (CEE4)
  620PRINTTAB(x%,30);e$ (1897)
  630TIME=0:REPEAT UNTIL TIME>
200 (F575)
  640COLOUR128 (93B3)
  650PRINTTAB(x%,30);e$ (BDD8)
  660COLOUR7 (2610)
  670ENDPROC (097D)
  680: (AD27)
  690DEFPROCexit (875A)
  700*DIR :0.$ (F427)
  710CHAIN"Menu" (EE8B)
  720ENDPROC (DBDD)
>
```

The programs in this article have been listed using the *A&B Computing Checker*. The four digit hexadecimal number in brackets at the end of each line is the "checksum" for that line. It is **not** to be typed in.

With Checker installed, each program line is assigned a unique checksum when RETURN is pressed to enter that line. Compare the checksum number on your screen with that in the magazine to be certain that a line has been correctly entered.

Checker is published periodically in A&B, featured on most Software Sale discs and is available on disc, price 1 (20p p&p). Cheques made payable to Phoenix software.

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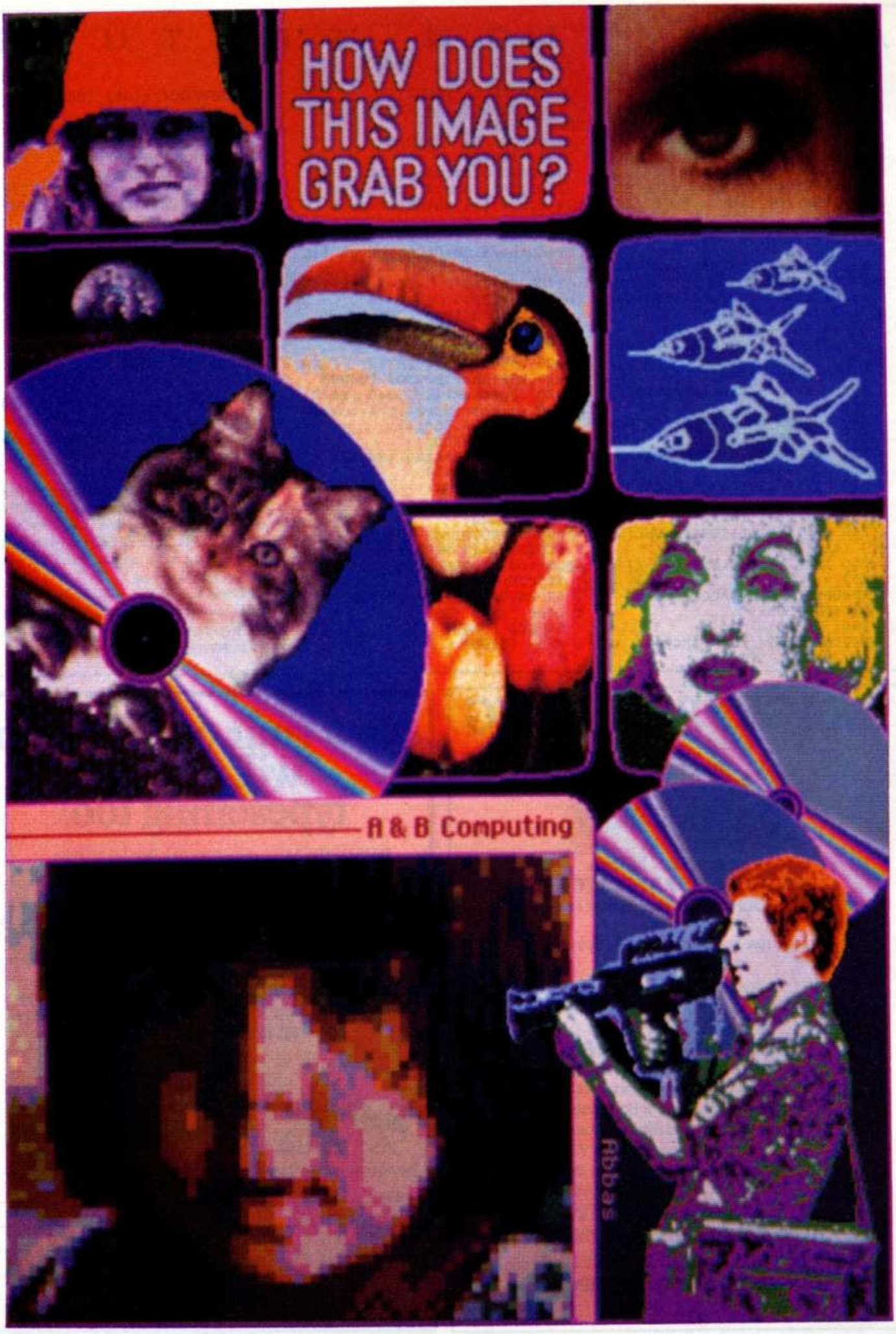
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A & B Computing
Abbas

INTERACTIVATE

We look at new developments in Interactive Video

You may remember the Videodisc from the late '70s; they were going to oust video recorders from the marketplace by offering a cheap way of purchasing motion pictures, and offering a higher quality of sound and vision – previously unattainable using home video systems.

Unfortunately for Philips, Laservision didn't make it for many complex reasons – The Laservision system reappeared in the early '80s as a novelty add-on for Arcade machines which gave the idea of computers and laserdiscs working together something of a bad name as they were just seen as an excuse for the poor quality graphics of the time.

It is only in the last couple of years that the computer industry has realised some of potential of video images linked to a computer database, thanks largely to Philips and Acorn.

You may have seen various prototypes on display at numerous computer shows over the past few years, however, production models have only been available for the last 18 months.

An interactive Master with all the trimmings for Domesday and beyond

Domesday and Beyond

The disc that launched the system was the (arguably hyped) *Domesday Project*. This was the result of two years worth of information gathering on the part of schools all over the country and has grown into an impressive national database.

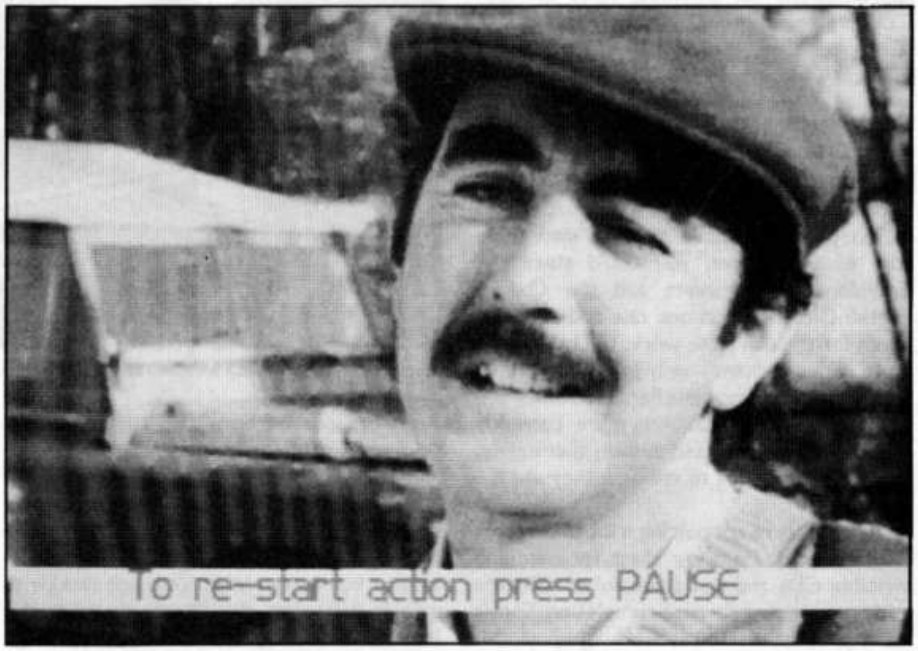
The hardware required to handle this amount of data, has to be fast, so a BBC Master with a Turbo Co-processor is the basic requirement as well as a Philips Videodisc player, trackerball and, of course, twin 80 track Disc Drives. Not surprisingly, the cost of all this limits the target audience, which is a shame, because the schools that provided much of the information for the system cannot afford to purchase systems of their own! The result is that local education authorities and councils are buying systems for key local venues such as libraries and colleges.

Although prices don't look like they are going to drop for a little while yet, new markets for Interactive Video products (I.V.), are appearing after the launch of new laserdiscs for use with the Acorn system. BBC Milton Keynes, (the people responsible for putting together the Domesday system) have developed new discs initially launched at the Interactive '87 Exhibition in Brighton.

New releases cater for some pretty diverse markets:

Weightworld is an interactive videodisc aimed at people who want a fitness programme tailored for individuals. The database contains a questionnaire for users which enables the system to pinpoint which areas need to be covered in their plan. Large fitness centres and Gymnasiums are expected to utilize this system as an on site facility.

Corporate training courses seem to be very popular as videodiscs; several have been commissioned including a stress management ▶



A thoughtful John 'pauses for the user'

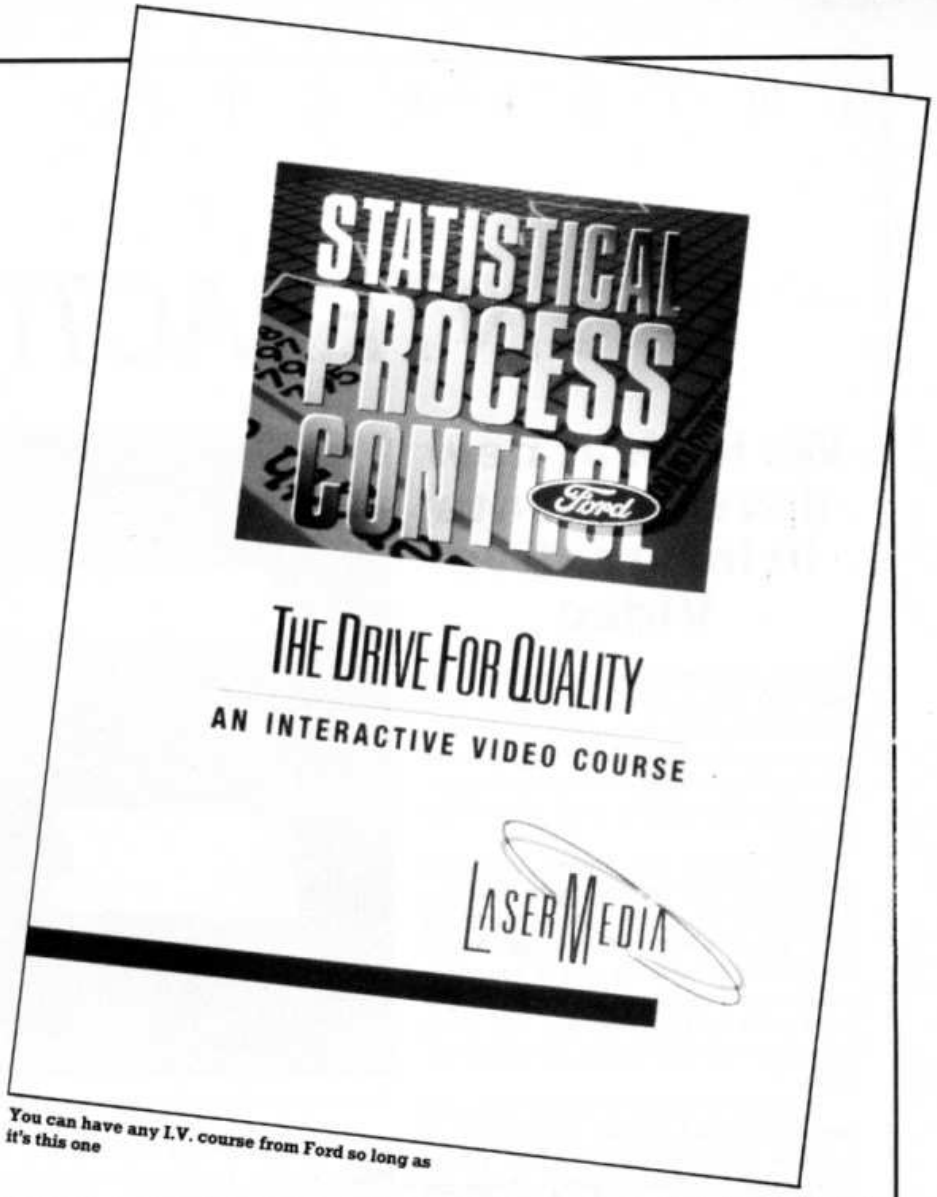
course for the Manpower services commission, another has surfaced from LaserMedia which deals with statistical process control for the Ford motor company.

All this diversity doesn't mean that the educational market has now been disregarded in favour of more lucrative commercial markets; extensions to the Domesday Disc have now been launched.

Domesday *Display* allows the extraction of frames from the original disc which can be put in an order of your choice and captioned – almost slide show style. *Data Merge*, also from BBC AIV, goes one step further, and allows the user to customize Domesday data allowing highly localised resource material – making the Domesday Disc more topical and useful.

Other laserdiscs have been produced with schools in mind, covering topics such as anatomy as well as the geography of the British Isles, so it is fair to assume that the scope for innovative laserdisc software will, in the fullness of time be explored.

Adrian Price Interactive have produced a "Companion" interactive video interface which will plug into a standard BBC Micro and hook up to an industrial VHS video recorder. This will allow people with modest TV facilities to author their own IV lessons, the price for a system (including an industrial VHS Video) is £1475 – still an expensive product.



You can have any I.V. course from Ford so long as it's this one

The Future

Smaller and cheaper developments come from Japan in the shape of the Compact Disc. Several manufacturers – including Sanyo and Sony – are to equip their top CD players with a communications port so that you can directly access the CD's processor bus.

The first of these players should be available in Europe by early 1989, along with approximately 50 software titles on CD. CDs are being used in two ways; *CD-I* (Compact Disc Interactive), which is, in effect, a variation on the laservision format, enabling video images and digital data to be retrieved.

The other format, *CD-ROM* is not used to store video images, but it does hold lots of information.

To put CD-ROM's capacity into some sort of perspective, you could store the Encyclopaedia Britannica and the Oxford English Dictionary on one disc and still have room for the complete works of Shakespeare *and* Charles Dickens – only previously attainable by using a removable hard disc.

Rumour has it that Acorn are currently working on a CD-based system themselves. It will be interesting to see how they use it – if it exists.

The Japanese are putting a lot of research into this area. Plans are afoot for read and writable CDs and and a handful of software packages are already near completion. Sony's CD-I product division is working on an "in-car heads-up" display, which will project local maps and information onto the windscreen.

Going for the best of both worlds – Philips interface laserdiscs with their own micros

Another idea of Sony's is to combine a pocket television with a portable CD player and are calling the combination a "Bookman". The Hitch-Hikers Guide to the Galaxy may be a reality!

Admittedly, CD-I is still very much in its infancy, but we can rely on the Japanese (with a little help from the Dutch) to bring this level of technology down to the price range of mere mortals. In the meantime, the Philips format continues to gain popularity, and has certainly proved itself as a useful tool and teacher for a number of different types of user.

Comparisons with video have been drawn – as we now have two incompatible formats – both after ultimate supremacy in one market, (in much the same way as VHS and Betamax did a few years ago in europe), like VHS and Betamax, both systems will no doubt find their own areas within the marketplace in which to grow and develop.

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Z88

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Memory
The Z88 comes with 32K of RAM built in, of which around 20K is available – enough for about 2,000 words of text. This is easily expandable to 416K by simply slotting in additional RAM packs (see back cover). With the introduction of soon-to-be-released 1 Mbyte packs, total RAM of 3 Mbytes will be available – enough to hold the complete works of Shakespeare.

Keyboard and display
The Z88 has a full QWERTY keyboard with virtually silent, short-travel keys. It includes special function keys, such as ◇, □, INDEX and MENU which make it exceptionally easy for novice users to quickly find their way around the sophisticated built-in software.

The screen is a state-of-the-art supertwist LCD, which provides a massive improvement on normal displays in both contrast ratio and viewing angle – providing a clear, sharp read-out. The screen's format is 8 lines × 106 characters, and provides a large working area of 8×94.

The remainder of the screen area consists of sections which hold menu details (including all the Z88's commands); a unique page map (which shows you where you are on a complete page); diary date; filing and directory details; and operating system details which give you information on the Z88's status (such as battery strength).

Software
The Z88 comes with a built-in suite of applications software, which is exceptionally capable, yet extremely easy to use.

The operating software, OZ, allows you to switch between, for example, word processing and spreadsheet applications – without the delay of loading separate disk-based software into the computer's memory. With the Z88, it's just a matter of pressing a couple of keys.

Built-in applications software includes *Pipedream*, which features word-processing, spreadsheet and database functions.

Word Processing Facilities include block marking and movement, searching and replacing, and multi-column layout. The display is fully WYSIWYG (What You See Is What You Get), showing bold, italics, underlining, centering, and dynamic page breaks as they appear on the printed page. Each page of the document is represented by a page map which shows the layout of the text.

Spreadsheet Invaluable for financial planning, this application allows you to define a series of formulae within cells (where a row and a column meet) and then to enter a series of numerical variables for manipulation. It allows profit and loss, cashflow and budgets to be quickly and easily arrived at.

Database This works on the same principle as spreadsheet – so data being stored for later retrieval is held in a known cell where it can, for example, be manipulated into ascending sequence.

Diary The Z88 diary software is a free-form log that can be configured in any way you choose, within the constraints of the Z88's memory. It's particularly useful when used with the Z88's calendar and clock to find dates and set alarms.

Popdowns include a powerful calculator, clock, calendar and alarm. A printer editor allows you to configure Z88 codes to match a wide range of printers, and to store printer definitions if you're using more than one type.

Resident programming language is BBC BASIC with assembler. Communications to the outside world are achieved using a VT52 terminal emulation mode or the Import/Export facility which allow transmission and receipt of data files between the Z88 and other PCs.

Power supply
The Z88 runs on four commonly available AA batteries, which provide around 20 hours of active computing, or a year on standby mode. Switching off puts the Z88 into standby; all data in RAM stays live, drawing minimal power from the Z88's batteries. And when the batteries need to be changed, a special capacitor (or the mains adapter) preserves the data.

CONTINUED ON LAST PAGE OF ADVERT ►

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Archimedes micro

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They have separate keyboard and a three button mouse as standard. The Keyboard is compatible with the new IBM ATE layout, with 12 function keys.
The standard display is a high resolution mono colour monitor. A colour, multifrequency monitor is optional.
The screen modes include:
- 80 × 25 or 32 characters, in 2, 4 or 16 colours for wordprocessing, etc.
- 132 × 25 or 32 characters, for spreadsheets, etc.
- Up to 640 × 256 dots × 256 colours (with single frequency monitor) and up to 640 × 512 dots × 16 colours (with a multi frequency monitor), for graphics, etc.

The sound system can have up to eight channels playing at once, from up to 32 instruments or voices, using waveform synthesis and stereo output.
The outlets for the monitor, printer, serial port and audio are all at the rear, and have industry standard connectors.
The 410 and 440 have a backplane for four expansion podules and the circuitry for a Winchester disc drive as standard.
The complete operating system – including Window Manager and Desktop – is in 0.5 MB of ROM. It can access directly all the RAM that can be fitted (upto 4 MB).
The Advanced Disc Filing System uses robust, pocket-sized 3.5" discs with a new 800K format, but also reads, writes and formats the 640K discs used by the Master series. As well as 25% more capacity, the new format allows almost four times the data transfer rate.
A battery-backed clock-calender, and CMOS RAM to hold configuration setting is standard.
Expansion is via internal plug-in boards (podules), which connect with the backplane.

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(Securicor carr. £7 on Micros)

0.5 Mb RAM for 305	£85
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ARM Assem. Lang Prog Manual	£12

Podules expected this year (from Acorn unless stated) include:

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Econet Network Board	£43
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MIDI add-on to I/O Podule	£29
ROM Podule (takes five 8 bit ROMs, of 16, 32, 64 or 128K)	£59
Modem Podule (Beebug)	TBA
Real time Video Digitiser (Watford)	TBA
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What Archimedes can do

The software on the welcome disc includes four applications.
"PAINT" is a simple mouse driven art package, operating in the 640 × 250 × 16 colour screen mode. Images can be produced without any programming and saved to disc for use elsewhere.
The Sprite Editor allows sprites to be created pixel by pixel in the 640 × 256 × 16 and 256 colour screen modes. It can also be used to edit pictures from "Paint". The results can be used in Basic programs for animated graphics.
The Font Designer "allows you to design individual letters and symbols – and save them together as a font". They may be "anti-aliased", for even better appearance on screen.
The Music Editor allows you to enter music in standard notation, with up to four "parts", and save it to disc. It may be played via the internal speaker (in mono) or via external headphones or hi-fi (in stereo). The voices or instruments (of which there are nine as standard), and their volume, tempo and stereo position may all be varied while playing.

BBC Basic 5

This is upwards compatible with earlier versions, so most programs written in them will run – though far faster. Even using a 305, up to 370K is available in Basic. It also affords access to all the new graphics, windowing and sound facilities – as shown by the applications on the Welcome Disc. As well as being in the system ROM, BBC Basic 5 is provided on disc for loading into RAM because it then runs about 40% faster. This speed makes it the FASTEST MICRO IN THE WORLD". BBC Basic 5 includes an in-line Assembler.

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A great many packages are expected in early 1988. The topics include: Business Studies, Maths, General Science, Biology, Physics, Chemistry, Economics, Geography, History & Music.

PC EMULATION

The Acorn PC Emulator (for 310, 410 & 440), includes MS-DOS 3.21 and is available NOW at £89. It runs most MSDOS and many PC-DOS applications (which number over 10,000). Compared with IBM PC, this all-software emulator can calculate about half as fast, and write to the screen about a quarter as fast. This makes it more suitable for running spreadsheets (such as Lotus 1-2-3) than wordprocessors (such as Wordstar). However it includes utilities for copying disc files between DOS and ADFS formats, so that data may be transferred to and from Archimedes applications. The 3.5" discs used by the new IBM PS/2 models, and by many DOS portables, may be read, written and formatted directly. 5.25" discs require an additional, external drive, which is available as an option. The PC Podule (due second quarter '88), will run very much faster. £99

LANGUAGES

Acornsoft ANSI "C", ISO-Pascal, Fortran 77, Cambridge LISP and PROLOG X are all available now at **£95** each, as is the Twin Editor, at **£29**. These require at least a 310. The ANSI "C" affords access to all the graphics, windowing and sound facilities of the Archimedes and executes at exceptional speed – 14 to 26 times that of a PC, 5 to 10 times that of an AT, and as fast as most 386 machines. (For demonstration, call in at our retail shop.
If you require technical literature, then simply telephone us).

Archimedes to BBC SERIAL LINK

Using this simple data link, it is possible to solve all your BBC to Archimedes data transfer problems. The kit is supplied with two disks, one 5.25" for the BBC, the other 3.5" format for the Archimedes, and the necessary cable to connect the two computers. Using this package it is possible to transfer any data from the BBC to Archimedes at upto 19200 baud.
By far the easiest way to transfer data to your new computer.

Only £25

Archimedes 5¼"/3½" Disc drive Interface

With this interface it is possible to connect almost any 5¼"/3½" disc drive with its own power supply to the Archimedes. Upto FOUR drives can be connected and NO SOLDERING is involved. Supplied complete with necessary lead.

Only £25

Note: This is not simply a lead. Attempting to connect an external disc drive by direct connection may result in damage to your Archimedes.

Archimedes Printer Lead	**£8.50**
Archimedes Monitor Lead	**£7.50**

BBC MASTER

BBC MASTER 128K Micro incl. Acorn's: View, Viewsheet, ADFS, BASIC Editor & TERMINAL **£379**

SPECIAL OFFER

FREE . . . £105 worth of Hardware & Software

Gemini's OFFICE MATE & OFFICE MASTER packages on Disc consisting of: Database, Spreadsheet, Beebplot graphics. Accounts packs: Cashbook, Final Accounts, Mailist, Easyledger, Invoice & Statements, Stock Control and ***Watford's*** *3½", double sided 1 Megabyte (unformated) single disc drive complete with cables, ready to connect to the micro – with every BBC Master purchased from us this month.*

BBC MASTER with Turbo Board + above SPECIAL OFFER **£475**

512K Processor Add on Board "inc. Mouse and GEM package" **£185**
BBC AIV (Domesday) System **£4479**

ADD-ONs & ACCESSORIES

Turbo 65C102 Add-on Module	**£95**
Econet Module for the Master	**£40**
Twin ROM Cartridge for Master	**£7.50**
Quad ROM Cartridge for Master	**£12**
Universal Processor Adaptor	**£75**
Master Reference Manual I	(No VAT) **£14**
Master Reference Manual II	(No VAT) **£14**
Master Advance Ref. Manual	(No VAT) **£19**
64K Upgrade Kit for B+	**£32**
Acorn 1770 DFS Kit complete	**£41**
ECONET Upgrade Kit for BBC	**£42**
ALL ECONET UPGRADES Available	
ARIES' Professional IEEE Interface	**£238**
Acorn IEEE Interface Complete	**£265**
Morley Teletext Adaptor with ATS Rom	**£99**

BBC MASTER COMPACT

All Master Compact Microcomputers are supplied complete with an integral 3½" Disc Drive and various educational and professional bundled software.

System 1	Standard Package	**£310**
System 1A	System 1 + TV Modulator	**£322**
System 2	System 1 + Green Hires Monitor	**£364**
System 3	System 1 + Medium Res Colour Monitor	**£478**
RS232 Kit for BBC Compact		**£25**
Additional 3½" Drive for BBC Compact (Securicor carriage £7)		**£90**

CO-PRO Adaptor

Now for the first time you can add the Master Co-processor boards, to your standard BBC model B, or B Plus. With this brand new launch from Watford Electronics you can attach any BBC Master co-processor to the original BBC Micro. Once again Watford strides ahead with a new concept in BBC B Micro add-ons. This unique external Co-Pro Adaptor, is protected by patent applications.
Use the super fast Turbo Board with your BBC B, it is much faster than the 6502 2nd processor superseding it.
With the 512K addon your standard BBC machine achieves IBM PC compatibility at a realistic price running GEM, Lotus 123 and many other programs. Included with the 512k package is a high precision mouse and the Digital Research GEM suite of software; GEM Desktop, GEM Write GEM Paint. This requires both the 1770 DFS and the ADFS to be fitted to your computer.
To use other co-processors you require a BBC B with DNFS 1.20 or higher, or BBC B+ fitted with 1770 DFS 2.20 or greater. Co-processors work exactly like a second processor.
Master owners may use Co-Pro to add a second Co-processor externally.
Watford, brings power to your BBC at only:

£35 (carr £5)

CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 50234 or 33383

The 80186 Co-Processor

This package consists of the Master 512 board, Watford Co-Pro Adaptor, 1770 Disc Upgrade and Acorn ADFS. The Master 512 board using the 80186 16 bit Processor at 10MHz and running Digital Research DOS Plus, gives a high degree of IBM compatibility at an extremely reasonable price. Included in the 512k package is a mouse and the amazing Digital Research GEM suite of software; GEM Paint, GEM draw and GEM desktop giving a complete Mouse Icons environment (All other GEM packages will work on the 512k). Famous packages that will work with the 512k board include Wordstar, Dbase II, Lotus 123 and many others. The only requirement to upgrade any BBC Model B to this system is you must have twin 80 track disc drives.

£259

65C102 2nd PROCESSOR

This amazing package consists of the Acorn 65C102 'Turbo' Board, the Watford Co-Pro Adaptor and Acorn 1.2 DNFS ROM. The 'Turbo' board, running at 4MHz with 64k of additional RAM will increase the speed by between 50 and 200% depending on the application running, and allow a BASIC program of upto 44k in any screen mode. Simply by plugging in the Co-Pro and the DNFS ROM with its special Tube host code and you massively increase the power of any Model B.

£135

SPECIAL OFFER

EPROMs for BBC's Sideways ROMs.

2764-250nS £3.00
27128-250nS (12V5) £3.25
27128-250nS (21V) £4.25

RAMs (Low power) for ATPL, WATFORD, etc..

Sideways ROM Boards

6264LP (8K) £2.50
2 × 6264LP (16K) £4.80

Z88 Sinclair's Portable Micro

Watford Electronics announce a very special new – and affordable portable microcomputer, tailor-made for the BBC Micro user on the move – the Cambridge Z88.

The Cambridge Z88 is a versatile portable micro, bursting at the seams with built-in software ready and waiting for you to use at the push of a button. There is BBC BASIC, a word processor, a database, a terminal, a filer a diary and a calculator, all integrated and all inclusive!

The Cambridge Z88 uses just four AA batteries, and from this it will store all of your programs and files on a built-in RAM disc, so there are no cassettes to worry about or discs to lose.

The LCD display is particularly impressive, using state of the art Supertwist technology, the display is sharp at all times, and clear under even the worst lighting conditions.

The word processor is based on Acorn's View package; View is the most popular word processor available for the BBC Micro, and files and programs written on the Z88 can be transferred to and from the BBC Micro with consummate ease.

The Pipedream word processor is possible the single most powerful package written for a portable yet! Being an integrated Spreadsheet and word processor you can combine text and numbers to create stunning reports, timetables or simply letters in a variety of column widths (up to 80 column) and numeric data can be freely sorted searched and calculated INSIDE a text file – a feature only previously available on much more expensive software packages running on large machines.

Nearly all of the 32K memory is available as the RAM Disk, although additional memory packs of 128K are also available, just plug them into the machine (no soldering – no screwing) and you have four times the memory you had before, all of which is available to the Word Processor.

Connecting the Z88 to the BBC Micro is easy; by plugging in the RS232 cable from the Z88 into the RS423 socket in the back of the BBC Micro, a data exchange as fast as 19200 baud is achieved, making the Z88 a fast machine for data transfer.

Custom software is available for the BBC Micro enabling automatic transfer of files to and from the Z88 with automatic conversion and full error checking. The connecting lead plugs straight into the back of the BBC Micro and into the side of the Z88 to form a reliable data link faster than some disc drives!

The Z88 is rugged, reliable, lightweight and compact. It is considerably lighter than all other portable computers currently available, and because it doesn't need disc drives, it is more reliable than any PC "laptop" portables making it especially useful to the BBC Micro owner away from work or home.

Here's what A&B Computing had to say about the Z88:

"The Z88 is an especially worthy machine to have on the move because the files it creates in Pipedream are directly compatible with View Professional... you can write a full report using all of the facilities of Pipedream, port it across using the BBC link software and load it into View Professional".

"The Z88 is surprisingly easy to connect to the outside world – it simply has oodles of RAM disc (up to three megabytes) which can be plugged into the machine".

Need we say more? The Cambridge Z88 – a very special computer. Our Managing Director liked it so much that he uses one constantly.

Price: **£249** (carr £3)

FREE

As an introductory offer, we are giving away, 4 rechargeable batteries and a compact Mains Battery Charger absolutely FREE with every Z88 bought from us this this month.

ACCESSORIES

Mains Adaptor	**£8.65**
32K RAM Pack or 32K EPROM Pack	**£17.35**
128K RAM Pack or 128K EPROM Pack	**£43.40**
Z88 BBC or PC Link	**£21.70**
Z88 EPROM ERASER	**£34.75**
Serial Printer Cable	**£8.65**
Parallel Printer Cable	**£24.00**
Z88 Modem	**£86.90**

Continued

We stock a range of monitors to suit all needs. Choice of a monitor is a matter of personal taste so we recommend that whenever possible, you ask for a demonstration at our shop. **All Monitors are supplied complete with BBC connecting leads FREE.**

MICROVITEC 14"

- 1431 – Standard resolution as used on the BBC television computer programme **£175**
- 1451 – Medium resolution, suitable for word processing in mode 0 **£225**
- 1441 – High res, exceeds the capabilities of the BBC micro **£359**
- 1431AP RGB + PAL and AUDIO **£199**
- 1451AP RGB + PAL and AUDIO **£255**
- **2030 CS 20" Med Res** **£380**
- **2040 CS 20" Hi Res** **£675**
- Dust Cover for Microvitecs **£5.50**
- Touchtec 501 Touch Screen **£239**

TAXAN 12/14"

- **TAXAN Super Vision 2 Type 620** Hi-res RGB Colour monitor. Ideal for Wordprocessing **£269**
- **TAXAN Super 3, Type 625** Ultra Hi-res, RGB Colour) Text mode switch allows monochrome text display in Green, Amber, White reverse or White on Blue **£319**
- **TAXAN 14" Multisync 770 Plus** – An autoscanning Ultra high res, colour monitor. Ideal for Archimedes **£449**

- Philips BM7542 12" Paper White Monitor. Attractively finished high res monitor. Has an etched glass anti-glare screen and a tilt stand for optimum viewing angle. 1000 x 850 pixels resolution coupled with high contrast makes it ideal for both word pro and graphics. The paper white display is ideal for DTP and CAD. Has a Video/Audio input. **Only £65**

STAR BUY

- **PHILLIPS 14"** Hi-Res, dark glass, attractively finished Colour Monitor – supplied complete with RGB, SKART and Audio/Phono Inputs. A push-button switch toggles between Hi-Res monochrome green text mode and full colour display.

ONLY £195

ZENITH

"Now Test Bureau Recommended for use in Education"

12" high resolution monochrome monitor. Ideal for word processing as its green or amber screen is very restful to read. (These are the same professional quality, stylishly finished monitors as used in the larger Zenith PC Sys.)

Green (New Design) Hi-resolution **£66**
Amber (New Design) Hi-resolution **£70**

N.B. carriage on Monitors **£7** (securicor)

SPARE LEADS

BNC Lead for Zenith or Philips **£3**
Skart Monitor Lead **£5**
RGB lead for TAXAN Monitors **£3**

SWIVEL BASES

for Video Monitors

Our professional type swivel bases have front adjustable control. This alleviates the need to lift the monitor when adjusting the viewing angle.

for 12" Monitors **£10** (carr. £2.50)
for 14" Monitors **£14** (carr. £2.50)

Anti-Glare VDU Screen

These extremely effective, easy to install, 12" & 14" VDU screens eliminate harmful glare, improves contrast on colour monitors. Increases productivity in offices. A must for all wordprocessor users. Hundreds of these screens are in daily use in various branches of one of the leading High Street banks.

£12

Panasonic KX-P1081

Available NOW at a superbly realistic price, the KX-P1081 perfectly balances features, quality of construction and Value for Money to produce the printer of tomorrow, here today, ready to sweep the current generation of machines away.

Ingenious innovation in terms of software control codes permits great flexibility when it comes to defining the print style. A nippy **120 cps** of clear Draft text backs up the crisp 24 cps Near Letter Quality text mode, with upto 40 superbly useful downloadable characters. A delightful range of assorted character widths is efficiently supported, with sizes ranging from a broad 5 cpi to petite 17 cpi, EVEN in NLQ mode. Some of the extensive support for serious use includes specialised functions to perform justification, centering and even left and right ranging. Proportional spacing permit even greater freedom when it comes to advanced use. Not only is the full Epson RX compatible control code set implemented, but extra codes have also been added to cater for the NLQ options, etc.

A full 96 ASCII character set is supported, with an extended set of 32 international characters and IBM special characters as well as IBM block graphics characters. A 1K Print Buffer alleviates much of the wait time normally associated with printing, whilst the bi-directional logic seeking print head takes the quickest route to print as required.

(Price inludes, FREE a 4ft Printer Lead, and a Dump Out 3, Screen Dump ROM worth £35 with every printer purchased from us).

Special Price: **£149** (carr. £6)
Optional RS232 Interface: **£39**

Panasonic KX-P1082

To complement the hugely popular KX-P1081, WE are proud to announce the launch of Panasonic KX-P1082. This superb Letter Quality printer incorporates all the features of the KX-P1081, plus a draft speed of 160 CPS, (40 CPS in NLQ mode). Ideal for high through-put users. This is a similar speed to the Epson LX800, but has an in-built adjustable tractor feed as standard and the price is way below the price of its nearest rival.

(Our LOW price also includes £35 worth of FREE BBC Cable and Dump Out 3 ROM).

Introductory Offer: **£175** (carr. £7)

Panasonic KX-P3131 Daisy-Wheel Printer

This low-cost high-performance Daisy Wheel printer is ideal for anyone wishing to produce clear, immaculate letters or reports. It delivers, flawless text at 10, 12 & 15 CPS. Supports proportional spacing. Is Bi-directional. logic seeking. Printing speed: 17CPS. Has 6k printer Buffer. A printer of similar spec could cost a lot more than our ridiculously low price of:

Only **£239** (carr. £7)

Single Sheet Feeder **£175**
Tractor Feed **£90**

FREE 32K extra Printer Buffer with every KX-P3131 purchased from us this month.

VARIOUS PRINTERS & ACCESSORIES

- Brother HR15 RS232 Daisy Wheel **£275**
- Brother HR20 Daisy Wheel **£349**
- Epson EX800 Printer **£399**
- Epson EX1000 Printer **£545**
- Epson FX800 Printer **£295**
- Epson FX1000 Printer **£405**
- Epson LQ800 Printer **£358**
- Epson LQ1000 Printer **£529**
- Epson LQ2500 Printer **£790**
- Epson LX800 Printer **£180**
- Epson SQ2500 Printer **£899**
- Epson Paper Roll Holder **£17**
- EX800/1000 Colour Option **£55**
- EX800/1000 Colour Ribbon **£18**
- EX800 Cut Sheet Feeder **£130**
- EX1000 Cut Sheet Feeder £195
- FX/LQ/LX800 Single Sheet Feeder **£135**
- FX/LQ1000 Single Sheet Feeder **£169**
- Hi-80 Refills – Set of 4 Pens **£7**
- LX800 Cut Sheet Feeder **£75**
- LQ800 Tractor Feed **£44**
- LQ1000 Tractor Feed **£50**
- LQ2500 Cut Sheet Feeder **£195**
- LX1000 Cut Sheet Feeder **£305**
- **Hitachi 672 Colour Plotter** **£475**

(Securicor Carriage on Printers £7

EPSON PRINTER INTERFACES

All these interfaces fit inside the printer.

RS232	**£27**	RS232 + 2K Buffer	**£52**
IEEE 488	**£65**	RS232 + 8K Buffer	**£62**

KAGA/TAXAN PRINTERS

(IBM/Epson compatibles)

Kaga KP815 Printer **£269** (carr £7)
Kaga KP915 Printer **£350** (carr £7)
RS232 Interface **£49**
RS232 Interface with 2K Buffer **£69**
RS232 Interface with 16K Buffer **£89**

INTEGREX COLOUR JET PRINTER

- Colour Jet 132 Printer **£525**
- Paper Roll **£6**
- Screen Dump Software **£10**
- Colour Cartridge **£14**
- Black Cartridge **£8**
- 100 A4 OHP transparencies **£55**

PRINTER SHARERS

(Ideal for School environment)

Connects	Serial	Centronics
2 BBC Micros to 1 Printer	£25	£27
3 BBC Micros to 1 Printer	£36	£35
6 BBC Micros to 1 Printer	–	£99

PRINTER CHANGER

3 Printers to 1 Micro (Centronics) **£65**

(Cables extra, specify type required when ordering)

Professional Printer Stand

This new professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Additional facilities include: Easy access to paper from both sides, used with both top and bottom feed paper and with its dial controlled paper feed system with adjustable deflector plates it ensures smooth paper flow and automatic refolding.

£26 (carr. £2.50)

THE EPSON RX-FX-KAGA PRINTER COMMANDS REVEALED

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX-KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English, how to use and make the most of your KP810, PW1080A or any other Epson FX80 compatible Printers like Panasonic KX-P1080/1, etc., with the BBC Micro, both from BASIC and Wordwise.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

£5.95 (No VAT)

PRINTER LEADS

Centronics lead to connect BBC micro to EPSON, KAGA, SEIKOSHA, NEC, STAR, JUKI, BROTHER, SHINWA, Panasonic etc. printers.

Standard length (4 feet long)	**£6**
Extra long (6 feet long)	**£8**
Compact's Special Centronics Lead	**£9**
RS232 Cable	**P.O.A.**
IBM Parallel 1 metre Cable	**£9**

PRINTER RIBBONS & VARIOUS DUST COVERS

Type	Ribbons	Dust Covers
BBC Micro	–	**£3.50**
BBC Master	–	**£4.00**
Brother HR15/20	**£3.00**	**£5.00**
EX/LQ800	**£7.50**	**£4.50**
EX/LQ1000	**£8.00**	**£5.00**
RX/FX80/85/800/MX80	**£4.00**	**£4.95**
RX/FX100/1000	**£7.00**	–
Kaga/Texan KP810/815	**£5.25**	**£4.00**
LQ2500	**£9.00**	**£5.50**
LX80/86/800	**£4.00**	**£4.50**
M1009/GLP	**£4.00**	**£3.75**
Panasonic KX1080/81	**£4.50**	**£4.75**
SQ2500	**£25.00**	**£5.50**
Star NL10	**£4.00**	**£4.50**
Microvitec Metal	–	**£5.50**

Our attractive Dust Covers are manufactured from translucent PVC. The seams are stitched and edges are taped to prevent splitting due to continuous use.

Listing Paper (Perforated)

1,000 Sheets 9½" × 11" Fanfold Paper	**£7**
2,000 Sheets 9½" × 11" Fanfold Paper	**£12**
1,000 Sheets 15" × 11" Fanfold Paper	**£9**
1000 Sheets true A4 Fanfold Paper	**£11**
2000 Sheets true A4 Fanfold Paper	**£20**
Teleprinter Roll (Econo paper)	**£4**

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Carriage 1K Sheets £2.50. 2K Sheets £3.00

PRINTER LABELS

(On continuous fanfold backing sheet)

1,000 90 × 36mm (Single Row)	**£5.00**
1,000 90 × 36mm (Twin Row)	**£4.90**
1,000 90 × 49mm (Twin Row)	**£7.50**
1,000 102 × 36mm (Twin Row)	**£6.25**

Carriage on 1,000 Labels £1.00

MEGABUFFER 256

This new Megabuffer 256 from Watford is a full featured 256K Printer Buffer. It allows the computer to print 256,000 character in a short time thus freeing the computer very quickly. In short it makes light work of printing large documents, screen dumps, etc. It is extremely simple to connect. The features are:

- Low Cost, High performance.
- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatibility with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in test unit for both the buffer & your printer.

In conclusion it can safely be said that MEGABUFFER 256 is the ultimate printer Buffer for both the amateur and professional user.

Only £125 (carr £2)

OFFICE MASTER

CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trail balance.

FINAL ACCOUNTS – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

INVOICES & STATEMENTS – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only **£21** (Disc)

OFFICE MATE

- DATABASE
- BEEBCALC SPREADSHEET
- BEEBPLOT GRAPHICS

DATABASE – Set up a computerised card index system with powerful search facilities.

SPREADSHEET – Offers many calculation and editing features.

BEEBPLOT – Provides visual representation from Spreadsheet data.

OFFICE MATE Only £10 (Disc)

New Launch Offers
Disc Drives DP35-800S

A Double disc drive – with a difference! Times are changing fast for the floppy disk, and whilst the current standard for the BBC B and Master Series is the 5.25 inch disk, the standard for the future will most certainly be the smaller; faster and more reliable 3.5 inch disks – now a standard feature of both the Master Compact and the Archimedes Series.

To support the present disc drive users, and cope with the future, we have designed our own plinth-mounted disk system – called the DP35 800S, it contains both the 5.25 inch and the 3.5 inch drive formats as well as offer a firm and rigid support for a monitor on top. With the BBC Micro underneath, the plinth makes a surprisingly small footprint on the desk – leaving you more space to work with.

The 5.25 inch disk drive is 40/80 track switchable, and has its very own power supply running independently of the BBC Micro.

Watford's new plinth enables users to read, write and format disks both in DFS and ADFS format – currently the accepted standard for the Master Compact and the Archimedes, it also enables the user to read disks written for the Archimedes. Ideal for both BBC & Master.

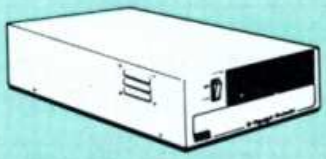
Launch Offer: **£165** (carr. £7)

CSPM 400/S DISC DRIVE

A single (1 Megabyte unformatted), double sided, 40/80 track switchable 5¼" disc drive mounted in a BBC Master Plinth (same as DP35-800S) but with a blanking plate to add a second disc drive at a later date. The in-built Power Supply is capable of running two disc drives. The unit is supplied complete with cables and a utilities disc.

Launch Offer: **£139** (carr. £7)

30 Megabyte Winchester Drive



Undoubtedly the best value for money Winchester Hard disc available anywhere for the BBC Micro.

This 30 Megabyte hard disc is completely compatible with the Acorn ADFS – that's why we have bundled it with each Winchester drive, along with a full user guide and full utilities including file copy, 1000K save routines, Format and Verify – in fact all you need and more.

Finished in rugged metal and fetching BBC beige, the Winchester has an internal fan, so quiet you won't even hear it! A switched mode power supply and a neon-lit on/off switch are there along wqith a light on the hard disc to tell you when it is working – just compare the price with our competitors' 20 or 28 Mbyte discs!

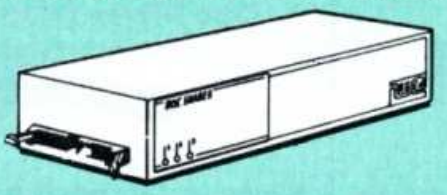
Compatible with the Master, and the BBC B (with 17"X disc interface).

Launch Offer **£449** (Carr. £12)

At last, it's here!
The Advance Reference Manual for the BBC Master
£19.95

NEW

DISC DRIVE SHARER



(Ideal for educational establishments)

At last, a low cost alternative to the Econet system. Watford's Intelligent Disc Drive Sharer allows you to connect 3 BBC micros (model B, B+ and Master series) to a single or double disc drive. Running under any DFS or DDFS, this intelligent unit will automatically queue the computers. Each computer has a status light dedicated to it. If it is green you will get immediate access to the disk, and red means that you are next in line. The unit plugs directly into the disc drive socket on each computer and is powered by the mains. (N.B. Not compatible with ADFS.)

Launch Price: **£59** Price includes 3 Cables

NOW WITH EXTRA FEATURES AT NO EXTRA COST – Watford's latest DFS 1.44

- Incorporates Acorn's Official Tube Host Code so that those with 2nd processors no longer need to waste a ROM socket on the DNFS.
- Option to DOUBLE the speed of BPUT and BGET.

If you already have the Watford Electronics DFS and wish to incorporate these new facilities then simply return your existing DFS ROM to us together with £5 remittance for an upgrade. Please pack the ROM securely and address the package to our Upgrades Dept.

WATFORD's & ACORN's SINGLE DENSITY DFS

Watford's popular and widely acclaimed DFS has now been available for five years and has gained a large following amongst serious and educational users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade. ***(P.S. Watford's highly sophisticated DFS is fully compatible with Acorn DFS). (not Acorn's 1770 DFS)***

- *Complete Disc Interface Kit including DFS ROM and fitting instructions* **£48**
- *Acorn's 0.90 DFS Kit complete* **£47**
- *DFS Manual (Comprehensive)* *(no VAT)* **£6.95** *(P.S. Our comprehensive DFS Manual covers both Acorn & Watford DFSs).*
- *Watford's sophisticated DFS ROM only* **£16**
- *We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only* **£12**
- *DNFS ROM only* **£17** ● *ADFS ROM only* **£25**
- *Watford's DFS is exclusively available from Watford Electronics and their appointed dealers only. Every ROM carries a special label with LOGO and serial number.*

NEW

WATFORD's Mk II Double Density DFS INTERFACE

Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our MkII DDFS board has been adapted to allow the use of Acorn ADFS.

Added features include:

- Acorn ADFS compatible – Use ADFS on our DDFS board.
- Tube host Code – No longer any need to have the DNFS in your machine to use Co-Processors, even the CoPro and Master 512.
- Auto 40-80 Track sensing – no need to fuss with 40/80 track switches (even works with protected disks).
- An extremely powerful 8271 emulation – ensuring compatibility with almost all software.
- New low profile – small footprint board.
- Fits with all third party ROM boards.
- Option to double the speed of file handling operations – BPUT and BGET.
- Operates in both single and double density modes.
- OSGBPB has been recoded, increasing still further the speed of file handling.

Please note that not all DDFS's are capable of providing either the full 80% storage increase or of allowing a file the full size of the disk – Ours allows both of these!
If you already have a DDFS (any manufacturer), and wish to upgrade to our MkII version, then simply return your existing ROM and DDFS board and we will supply the new DDFS for only **£30.00**.

- Special introductory offer **£39.00**
- DDFS Manual (No VAT) **£6.95**
- We will exchange your existing DFS Kit for our sophisticated DDFS for only **£25.00**

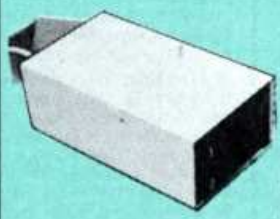
Please note, as the MkII DDFS is a hardware and software upgrade, it is not possible for existing Watford DDFS users to simply exchange their ROM for the new version.

SPECIAL DISC DRIVE/DDFS OFFER

Type CLS400

- The popular Mitsubishi 400k Single Disc Drive, Double Sided, cased with Cables. Plugs directly to your Micro.
- Watford's popular DDFS Disc Interface (allows 720k storage). Will run in both Single and Double Density modes 40/80 track Software switchable.
- A comprehensive User Friendly Manual.

A Bargain at Only **£130** (£6 carr)
(Offer valid while stocks last)



3½" DISC DRIVE OFFER

These top quality 3½" Double sided, 80 track, 1 Megabyte (unformatted each Disc Drives), are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc. They run directly from the BBC B/Master's own PSU.

- Single 400K Drive **£69**
- Twin 800K Drives **£126**

Mysteries of disc Drives & DFS Revealed

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

Then The Mysteries of Disc Drives and DFS Revealed is the book for you. It explains in detail the different types of systems available, how they are installed and how to use them. Many examples are given including pre-written programs to call various functions of the DFS available only through Operating System calls. Different types of disc, 40/80 tracks etc. are all explained. This book is ideal for the beginner confused by the plethora of choice available in the marketplace.

£5.95 (Book No VAT)

DISC ALBUMS

Attractively finished in antique brown leather look vinyl. Stores upto 20 Discs. Each disc can be seen through the clear view pocket.

£4

FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use. Available in 3½" & 5¼", please specify.

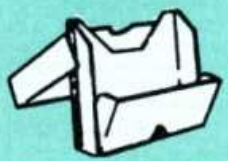
£7

ANTISTATIC LOCKABLE DISC STORAGE UNITS

Gives double protection – Strong plastic case that affords real protection to your discs. Antistatic helps avoid data corruption whilst in storage. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

- **M35** - holds upto 50 5¼" discs **£6.00**
- **M85** – holds upto 95 5¼" discs **£8.00**
- **M25*** – holds upto 25 3½" Discs **£5.50**
- **M50** – holds 50 3½" Discs **£7.50**

* Not lockable



PLASTIC LIBRARY CASES

Holds up to 10 5¼" Discs. **Only £2.00**

DISC PLONKER RACK

When using ones micro, there is a tendancy to have more than one Disc on the desk. This exposes them to the hazards of fingerprints, scratches, dust, coffee and an untidy desk.
Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. It holds up to eight 5¼" Discs.

Protection at Only: **£2**

DUST COVERS (For our Disc Drives)

Single CLS (without PSU) **£3.20** Twin CLD (without PSU) **£3.85**
Single CS (with PSU) **£3.95** Twin CD (with PSU) **£3.90**

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates capacity in single density mode. That within the brackets is the capacity in double density mode. All disc drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). All our 80 track drives are already fitted with a 40-80 select switch.

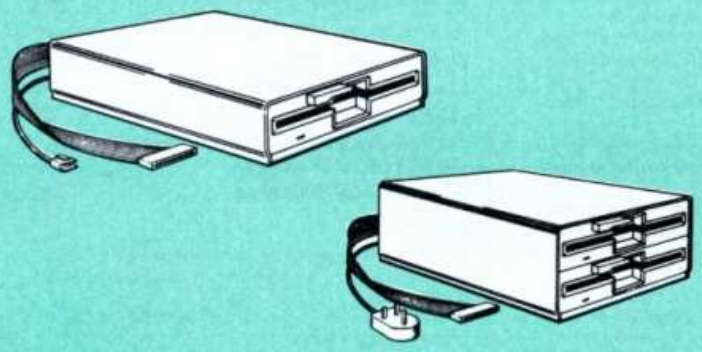
***All our Disc Drives are Double Sided and will operate in both Single and Double Density modes.** Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.*

Various other "manufacturers" of disc drives for the BBC micro (more accurately, "packages" label other manufacturers drives with their own name). We buy the high quality JVC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. Ideal for Schools & Colleges. We are now able to supply all single disc drives with Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives) allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below are for single drives in standard single cases. Single drives in a dual case cost an extra £5. (At Watford we anticipate your needs of tomorrow, not just today)!

When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space) your BBC, Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with Watford plinth. (Turn to the 6th page of our advert for the Plinths).
P.S. All our 5¼" Disc Drives with PSU are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.



Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
200K (360K)	CLS 200 £89		CS 200 £98	
400K (720K)	CLS400S £89	CLD 400 £168	CS 400S £99	CD400 £188
800K (1.44M)		CLD 800S £169		CD 800S £188

● TWIN Disc Drive Case, complete with Power Supply & Cables **£43**
Securicor carriage on Disc Drives £5 to £6

Prefix ***C*** *= Cased Drive*
L *= Less PSU*
S *= Single*
D *= Double*

Suffix ***S*** *= 40-80 Switchable*

e.g. CLS400S = Cased Disc Drive, Less power supply unit, single 5¼" 400K, (720K in double density); Double sided; 40/80 track switchable.

Cable to connect 5¼" Disc Drives to BBC Compact
Single £9 Twin £12
Special Cable to connect both 3½" and 5¼" Disc Drives
simultaneously to the BBC Compact £13

3M – DISKETTES

3M – SCOTCH Diskettes with Lifetime warranty from Watford Electronics your 3M Appointed Distributor.

- *10 × 5¼" S/S D/D 40 Track Diskettes* ***£8.25***
- *10 × 5¼" D/S D/D 40 Track Diskettes* ***£10.20***
- *10 × 5¼" S/S D/D 80 Track Diskettes* ***£12.75***
- *10 × 5¼" D/S D/D 80 Track Diskettes* ***£13***
- *10 × 5¼" 1.6M D/S D/D High Density Discs for IBM XT and AT* ***£28***
- *10 × 3½" S/S D/D 40/80 track Discs* ***£13.50***
- *10 × 3½" D/S D/D 40/80 track Discs* ***£19***

TOP QUALITY 3½" & 5¼" DISKETTES

To complement the range of quality discs and disc drives that WE already sell, WE are now supplying some special offer packs of 10 high quality discs. Each Disc has a reinforced hub ring and carries a lifetime guarantee. These are supplied complete with selfstick labels and packaged in an attractive plastic library disc box to protect them from damage. We strongly recommend these Discs.

DON'T SETTLE FOR LESS, BUY THE BEST

- *10 × **M3** 3½" D/S D/D 80 Track Discs* ***£18***
- *10 × **M4** 5¼" S/S D/D 40 Track Discs* ***£6.50***
- *10 × **M5** 5¼" D/S D/D 40 Track Discs* ***£8***
- *10 × **M7** 5¼" D/S D/D 80 Track Discs* ***£9***
- *3" Double Sided Discs* ***£3 each***

Special BULK OFFER on 5¼" DISCS

PRICES SLASHED

(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)

BULK PACK DISCS in lots of 100

Type	S-S 40T	D-S 40T	D-S 80T
● Without Sleeves	£35	£39	£45
● With Sleeves	£38	£42	£48

ACORN WINCHESTER DRIVES

FILESTORE E01	£825
FILESTORE E20	£705
Acorn 30MB Unit incl. Level III Software	£1520

PRICES SLASHED

WATFORD's WINCHESTER DRIVES

- 10 Megabyte Unit with ADFS **£399**
- 30 Megabyte Unit with ADFS **£449**
- 40 Megabyte Unit with ADFS **£749**

CDP800S **CDPM800S**

Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The switches are mounted on the front panel for ease of use.

CDP 800S for BBC Micro £192
CDPM 800S for Master £196
(Securicor Carr. £7)
(The above drive units are 2 Megabytes unformatted)

ACORN'S Twin 800K Disc Drives

Specially mounted side by side in a Master Plinth. Supplied complete with Cables. Plugs directly to the Master Computer.

RRP ~~£250~~

Our Price: Only £182
(carr £7)

Continued

NOMINATED FOR BRITISH MICRO COMPUTING AWARDS 1987

QUEST MOUSE

QUEST MOUSE

The ultimate in Mouse technology, the Watford Electronics Quest Mouse must be the most powerful Mouse package yet produced for the BBC Micro. Featuring state of the art 32K ROM software the Quest Mouse package is filled with features essential to the budding artist. The Quest Mouse is a high precision, low profile and large footprint mouse. It has three large comfortable buttons and is smooth and easy to use on most work surfaces. The Quest Mouse is FULLY HARDWARE COMPATIBLE with the AMX MOUSE so that it will work with any of the AMX range of software.

The two parts of the Quest package are available separately so that existing Mouse owners can upgrade to the Watford's sophisticated Quest Paint software or replace their existing worn out mice for a minimum cost.

QUEST PAINT

The Quest Mouse software is supplied on a PALPROM unit to allow the sophisticated 32K program to be used from a single ROM socket. It is compatible with the BBC B, BBC B Plus and BBC Master Series machines.

The software is used to draw high resolution Mode 1 pictures in full colour. All menu selection and control of the drawing process is performed with the mouse so that you will hardly ever touch the keyboard.

SOFTWARE FEATURES

The software is far too powerful for us to describe it fully in such a small space. Below is a list of the various features. Please write to us for a fully descriptive leaflet.

Disk interface not required. Utilities disk has facility to create and print big screens. Colours applied can be solid, either pattern of user defined pattern. Drawing can use brush or airbrush. Brush shapes can be defined and stored. Airbrush sprays colour/pattern randomly with four jet sizes and even or center spread. Colour cycles. Colour protection to stop particular colours from being overwritten by selected drawing actions. All standard drawing facilities like: rubber, straight pencil lines, triangles, circles, ellipses, rectangles, parallelograms, polygons, etc are provided. All shapes can be solid or just a boundary line. Once a shape has been set up it can be repeated anywhere on the screen. Global colour replace in a rectangle. Powerful fill facility for areas and vertical/horizontal lines. Full cut and paste of rectangular areas with rotation and size with screens from Watford Beeb Video digitiser. Load and Save screens with colour pallet information, save brush and pattern definitions etc.

Take The Guesswork Out of Selecting a Mouse Package

With reviews like this how can you go wrong.

Popular Computing Weekly, 9-11 June '87
"What you actually get for your money is a well built, three button mouse (far superior to the AMX mouse)."
"Overall the combination of a quality mouse and decent art package gives Watford Electronics a real chance of supplanting AMX as mouse supremos."

Micro User June '87
"Quest Mouse and Quest Paint can hold their heads high in the market. . ."

A&B Computing June '87
". . . Watford Electronics, a company famed for excellent hardware add ons and versatile software packages. Called Quest mouse, "this is a very special mouse driven drawing package..."

". . . you will have one of the most comfortable and professionally built mice I have used in a long time. The buttons are responsive, the mouse movement is smooth and without directional bias – a pleasure to use."

"What we have here is probably the best art package there is for the BBC Micro . . ."
"Quest Paint is a major leap forward in BBC programming. . ."
"Quest Paint is an original piece of programming, it is friendly and well endowed with many useful facilities. I would comfortably say it is easier to draw good pictures with Quest Paint than it is with more expensive 'Professional' art packages for the Atari ST and the Commodore Amiga. A recommended buy if you are looking for the best in BBC micro based art packages".

Acorn User, September '87
"The mouse (Quest) performs well in the face of competition from AMX, Wigmore and the rest . . ."
". . . this package represents excellent value for money. If you are interested in art then this program is for you to buy".
"Given time, I can see no reason why Quest Paint shouldn't take on the title of the definitive art package available for the BBC Micro to date".
"All in all, Quest Paint is a very professional package. It contains virtually every feature the budding artist could require".
"What makes Quest Paint so versatile is the addition of a sub-menu which allows you extensive control over each function".
"Until recently, Superart from AMS had been judged as the definitive mode 1 graphics package for the BBC micro. But now it has a serious rival in the form of Quest Paint, from Watford".
"As a measure of what is contained within Quest Paint, I would say it had all the features of Superart plus . . ."
"In most art packages, provision is given for drawing triangles and rectangles. Quest Mouse goes 14 better, allowing any regular polygon of upto 16 sides".
"One facility, not found on any other Art package to my knowledge, is the ability to access a digitiser from within the program". The reviewer concludes by saying, "The result is an extremely comprehensive and professional art package".

John Kilby, Head of Computer Science, Bishop Wulstan High School, Rugby, writes:
"Quest has been an excellent piece of equipment. The problem that seems to occur everyday is that at lunchtime the pupils rush to the computer room to make sure that they are first in the queue for the 'Quest' mouse".

Lt. Cln. C.G. Holton, G2 HQ 1 (BR) Corps, BFPO 39, writes:
"As ever your service is superb and the Quest Mouse proves every bit as good as the adverts claim".

Beeblet User Group, New Zealand Oct '87:
"One of its nicer features is that the top menu is done in Mode 0, the drawing itself is in Mode 1. Thus on screen together are two different Modes. A neat way around an old problem".

"PAN is used when a larger than one screen size image is required. The mind boggles at an A3 size drawing".

"I like it partly because of the mouse itself which is smooth and easy to handle but mainly I suppose because of the features I longed for and previously never got. Its easy to use with almost everything at your fingertips from the mouse. The software is simple where needed and complex where complexity is required".

ConQuest

Watford's Quest package is an extremely powerful and flexible drawing package, with very wide and unusual features. However, since its launch various suggestions for even more advanced & powerful facilities were received from the Quest users. ConQuest allows you these more advanced facilities, like, distortion of a cutout to any shape and a full font designer. If you also have a GXR ROM in your machine or you are using a BBC Master then ConQuest will take advantage of this to give ellipses at any angle, sectors and arcs, etc. Quest combined with ConQuest and Acornsoft GXR ROM make up THE MOST POWERFUL drawing packages available for the BBC range. Quest Paint is able to take advantage of almost any additions to your machine, such as Shadow or Sideways RAM. ConQuest takes this principal even further, by utilising the otherwise normally incompatible Sideways RAM facility by holding pictures in them.
Some of the features are:

- *Pick filenames off the screen for loading and saving.*
- *Rotate a cutout to any angle and Distort it to any four sided shape.*
- *Has Built in Font editor.*
- *Default brushes and patterns on startup.*
- *16 x 16 font available on start up.*
- *Ability to reset patterns, fonts and brushes to default at any time.*
- *ROM based enhanced Epson and compatible printer dump.*
- *ROM based enhanced extended picture routine.*
- *Ability to create and abort extended pictures.*
- *Improved disk access speed for extended pictures.*
- *User definable sideways RAM driver for incompatible sideways RAM systems.*
- *Ellipses at any angle on Master 128 (or B with GXR ROM).*

QUEST MOUSE & QUEST PAINT	***£59***
QUEST MOUSE, QUEST PAINT, AMX PAGEMAKER & PAGEFONT	***£85***
QUEST MOUSE ONLY	***£29***
QUEST PAINT SOFTWARE	***£32***
QUEST FONT DISC	***£12***
ConQuest 32K ROM Package	***£29***
QUEST MAT	***£3***
Part-exchange your old Mouse for a New QUEST MOUSE for only	***£23***
GXR ROM for BBC Micro	***£22***

N.B.
1. Quest Paint supplied complete with Software in a 32K ROM, Comprehensive User Guide and a Utility Disc.
2. Quest Font Disc has 22 text FONTS for use within Quest Mouse.

MARK II LIGHT PEN

Our Mark II Light Pen is the very latest in light pen technology. It is totally insensitive to local lighting conditions and works with many different monitors. The pen only responds to the High Frequency light produced by your monitor/TV. An LED indicates when valid video data is being produced. A conveniently located switch is also fitted.

Price Only £21
(Price includes FREE software Disc and Operating Manual)

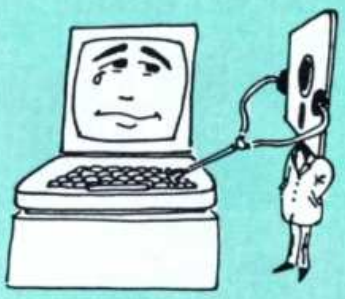
RB2 Marconi Tracker Ball

RB2 (AMX/Quest compatible)	£59
RB2 including Quest Paint	£85

FLEET STREET EDITOR

Software pack for BBC Micro	£31
Software pack for the Master	£39
Software Pack for Compact	£40
Admin Xtra Disc Utility	£13
Walt Disney Disc Utility	£13
Fonts N Graphics Disc Utility	£13

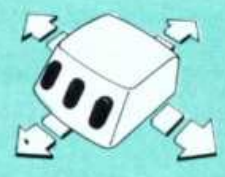
DIAGNOSTICS DISC



The BBC Micro is a very complex machine and thus diagnosing a fault can be very difficult. At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.
The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:
RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.
This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

THE NEW Mk III AMX MOUSE



ONLY: £59 **Inc. Super Art package**
(carr £1.50)
(Please specify for BBC, Master or Compact)

FREE our popular Colour Art software pack worth £15 with every AMX Mouse package purchased from us.

AMX MAT	£3
AMX MOUSE ONLY	£29
AMX DESK Package	£19
AMX UTILITY Package	£11
AMX SUPERART Package	£39
AMX STOP PRESS – A Desktop publising software. Works with Keyboard, Joystick or a mouse	£32

We are giving away absolutely FREE, our PAGE-FONT disc with every purchase of STOP PRESS from us.

PAGE-FONTS – Over 20 Fonts for use with AMX Pagemaker	£9.50
AMX DESIGN (ROM)	£59
AMX 3D ZICON Disc	£19
AMX Database Disc	£19
AMX XAM Educational	£15
AMX EXTRA EXTRA	£19
AMX MAX A gem of desktop (ROM)	£15

TED

THE ULTIMATE TELETEXT SYSTEM

TED is one of a new generation of powerful 32K ROMs for the BBC B, B+ and Master computers and is compatible with disc, tape and network systems. It is in everyday use in schools, colleges and universities, Programmers, Prestel I.P.'s, Micronetters and exhibitors have also found it indispensable.

TED includes the most comprehensive teletext (Mode 7) screen editor ever written for the BBC micro, combining flexibility with ease of use. Its sophisticated facilities include line, column and block copying within AND between frames; text, in a variety of styles and sizes, entered directly from the keyboard; graphics and line drawing modes; search and replace; margins; printer dump routines and a library of in-built icons and typefaces. TED will edit ANY mode 7 screen and can even convert high-res graphics screens to mode 7! Included within the ROM is a fully Epson compatable mode 7 graphics dump routine giving a grey scale printout of exactly what appears on the screen.

Using '*SHOW' (a versatile carousel), collections of mode 7 screens may be 'routed' or displayed sequencially, making it ideal for creating and running 'Viewdata' information systems. Over 1200 frames may bestored on a twin 80 track drive. A unique feture of TED is '*SCROLL', which lets you create pages of up to 600 lines which may be viewed 'Wordwise style', automatically or manually. SHOWs and SCROLLs may be freely mixed and even used from within a BASIC program.

The package comprises a 32K ROM, a 117 page manual, a function-key strip and a demonstration disc containing examples of real-time animation and a sample 55-frame database. A stand-alone machine code routine is provided allowing SHOWs and SCROLLs to be displayed on machines not fitted with TED.

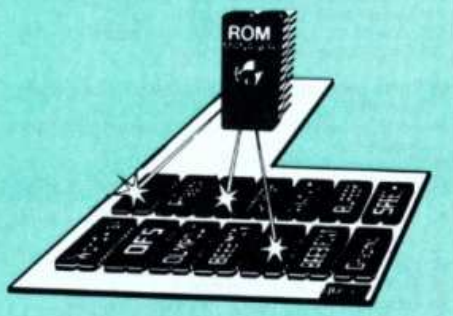
Price: £35

ROM-SPELL

Probably the most advanced and fastest spelling checker available for the BBC Micro. Compatible with View, Wordwise and Wordwise Plus ROMSPELL is simple to use with easy editing of incorrect words. Full facilities for editing the user dictionary to allow customisation to your personal needs. Dictionary includes over 30,000 words and is supplied with a Comprehensive manual.
NOT compatible with 1770 DFS.
(Please state 40 or 80 track disc)

Price still only: £25

ROM MANAGER



Take control of your Sideways ROMs with ROM Manager. This powerful utility ROM gives you power over your sideways ROMs. Disable whole ROMs, send commands directly to named ROMs and many other powerful facilities.
"Provides comprehensive management of all your installed ROMs" (BEEBUG November '84.)

ONLY £20

PLINTHS FOR BBC MICRO, MASTER & PRINTERS

Protect your computer from the weight and heat of your monitor. The BBC micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and monitor, whilst the double height version provides enough room for our stacked or side-by-side dual disc drives or TORCH Disc pack, to be placed in the centre section. If you use our stacked drives, the remaining space can be used for further peripherals e.g. Speech Synthesizer, EPROM programmer or simply stationery. The computer slides neatly in to the lower section allowing easy access to remove the lid. The printer plinth is equally sturdy but without the cooling slots. It allows for access to the paper from the front as well as from the rear, (a facility not often thought of in similar products) if the paper is located beneath the plinth. This is a very convenient way to work especially if your work area is not deep enough to take the printer and paper separately.

SINGLE BBC PLINTH	**£11** (carr. £1.50)
DOUBLE BBC PLINTH	**£19** (carr. £3.00)
PRINTER PLINTH	**£10** (carr. £1.50)
SINGLE MASTER PLINTH	**£14** (carr £1.50)
DOUBLE MASTER PLINTH	**£24** (carr £3.00)

COPY HOLDERS

How often have you been about to type hand written notes into your computer when you find that there's nowhere to rest the paper or that your notes are resting at the wrong angle to read the type? Whether the notes be your latest program or the draft of a new trilogy, the new Manuscript Holders from Watford are superb for holding your paper at the ideal height and angle to allow you read and type in ease and comfort.

Available in 2 versions, desk resting and shelf clamping versions, these two units hold your paper firmly by means of a plastic retaining ruler and a clip grip. Both units are full A4 size.

Amazing value at only
Desk Top **£10** (carr. £2)

Angle poise **£14** (carr. £3)

Continued

ARIES CORNER

The Aries B-32 Shadow RAM Card

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Comal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus, Interword and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved *FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the 6502 processor socket on your BBC micro – no flying leads to connect and no soldering. Provision of the on-board ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

Price: **£80** (carr. £2)

CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383

Aries B-12 Sideways ROM Board

This board is extremely well made, simple to install, reliable when fully loaded and compatible with the Aries-B20 and the Aries-B32

The B12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

The B12 system consists of two parts: a large detachable "mother board" which carries the extension ROM sockets and a small "base board" on a short ribbon cable, which plugs into the existing sideways ROM sockets. This two-board design eliminates the reliability problems previously associated with some other ribbon-cable based systems.

If you do not have a B32 or B20, a small adaptor module (the Aries-B12C) is available at a nominal cost.

Price:	Aries B-12	**£40**
	Aries B-12C	**£5**

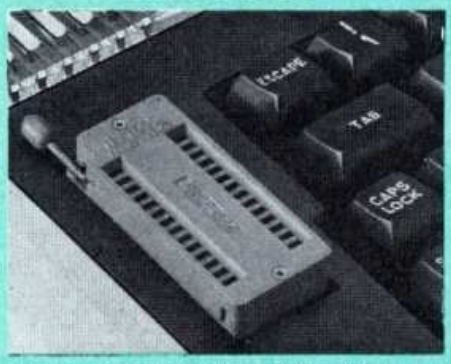
ARIES B-488 IEEE-488 INTERFACE UNIT

The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB' or 'HP-IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

£238 (Carr £3)

All prices in this advert are exclusive of VAT.

SIDEWAYS ZIF SOCKET



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.
- The low profile of the socket allows unrestricted access to the Keyboard.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for all professionals and Hobbyists alike.)
- BBC, B+ and Master compatible.

ONLY **£15** (carr £2)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack for the BBC B.

● Complete System	**£11**
● Spare Cartridges	**£2.50**
● Spare Rack	**£1.50**

16K Sideways RAM Modules

Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.
Key points to note about this new addition to the Watford range of products are:

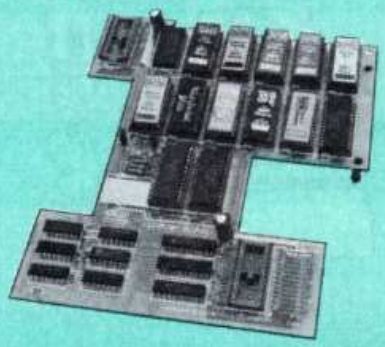
- Write protection (useful in a variety of circumstances).
- Read protection (allows recovery from ROM crashes).
- Compact construction.
- May be fitted in systems even with a ROM board.
- Multiple units may be fitted, even with a ROM board.
- No overheating or overloading problems.
- Free utilities disc supplied.
- Can be used as a 16K PRINTER BUFFER.
- Ideal for professional software development.
- Supplied with utilities software disc.

Only: **£24** (carr £2)

Optional extras

READ and WRITE protect Switches **£2** each
Battery for Battery Backup **£3**

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



In the May 1986 Micro User's independent review, the writer concludes, "The board has been well laid out. Its position is much better than others – not over the HOT RAM chips and further away from the disc controller area". "I give the solderless ROM board the thumbs up and wish it success".

This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expands the total possible number of ROMs in a BBC from 4 to 16.

Unlike our competitors inferior boards, the ONLY upgrade required for fitting battery backup to the Watford Solderless ROM board (all Watford ROM boards, actually) is the fitting of the battery itself. (No other expensive components are required.)

- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:
- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish") allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £32
Battery backup fitted **£36**
(carriage £2)

- Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer.

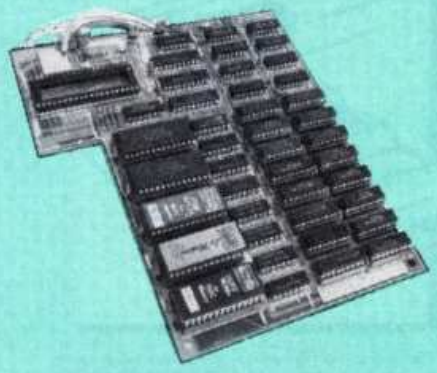
Only: £8

USER PORT SPLITTER UNIT

Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows two units to be connected to the User Port simultaniously, and select between them simply by toggling a switch. This device is particularly useful for those people using Quest Mouse and the Watford Video Digitiser or any similar combination.

Excellent Value at **£21**

ROM/RAM CARD



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 3 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO overheating problems.
- No User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Firm mounting in BBC micro.
- Compatible with all BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of Battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- Accepts any ROM.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE Fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROM-SPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

Please write in for further details.

INTRODUCTORY PRICES:

- ROM/RAM card with 32k dynamic RAM ***£39***
- ROM/RAM card with 64k dynamic RAM ***£52***
- ROM/RAM card with a massive 128k dynamic RAM **£80**

(carriage on ROM-RAM Card £3)

OPTIONAL EXTRAS:

- 16k plug-in Static RAM kit **£6**
- 16k Dynamic RAM for Upgrade **£7.50**
- Battery backup **£3**
- Read and Write protect switches ..... **£2** each

Complete ROM-RAM board
All options installed **£89**

P.S.
Is your existing ROM Board overflowing with ROMs? Do you need more Sideways RAM? Is your Board unreliable? Then upgrade to Watford ROM/RAM Board and pay £10 less

Le Modem

The MODEM from Watford

At last a professional MODEM for the BBC Micro. Unlike other 'Modem packages' this is a complete package there are no extra software costs to get 'up and running'. Of course Le MODEM is multi-standard, i.e. 300/300, 1200/75 & 75/1200 UK and BELL (USA) are all supported.

The features that make Le MODEM such good value are:

- *A complete communications terminal that transforms your BBC Micro into a very powerful World-wide data transfer system.*
- *Auto Dials, Auto answers, and is completely controlled by your micro. There are no external controls!*
- *Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICRO LIVE (BBC TV database), CITY BB and more.*
- *Designed to be SIMPLE but SOPHISTICATED. To LOGON to a data base all you have to know is its TELEPHONE NUMBER, Le MODEM does the rest.*
- *Supplied with a comprehensive telecomms package in a 16K sideways ROM which includes a FULL PRESTEL terminal allowing TELE-SOFTWARE to be downloaded.*
- *A comprehensive 80 column terminal. This includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!*
- *FULLY controlled by simple '*COMMANDS allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!*
- *Connects to the 1MHz bus. A *AUDIO ON-OFF command allows you to actually hear the telephone line through your BBC micro loudspeaker.*
- *Completely self contained with internal mains power supply. (Even a free mains plug is fitted!) A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.*
- *Packaged in such as way that you need nothing else except a BBC Micro to communicate with computers all over the world.*
- ***FREE Registration to MicroLink.***

SPECIAL OFFER

Price: ***£94***
(carr £3)

(Price includes, Le Modem, Software ROM, Cables & Comprehensive Manual)
(Write in for further details)

Minerva Systems Software

System Delta with Card Index	£55
System Programmers Ref. Guide	£19
System Gamma	£43
System Gamma Prog. Ref. Guide	£19
System Mailshot	£17
System Reporter	£17
System Intrer/View Link	£17
System Sales Ledger	£39
System Purchase Ledger	£39
System Nominal Ledger	£48
System Stock Management	£39
Order Processing/Invoicing	£39

APOLLO

The NEW Modem from Watford

Following numerous requests from you, our discerning customers for an APPROVED, Low Cost & High Performance modem with Auto Dial & Auto Answer facilities as standard) we bring you the versatile APOLLO Modem. Just compare the features and look at the price (which incidentally includes the cost of the Software, manual and BBC connecting cable). We are sure you will agree that Watford Electronics in their traditional way are giving you a super 'value for money' deal.

Just look at these features:

- V21 for Bulletin boards, Microlink, Telecom Gold, etc.
- V23 for Prestel, Home Banking, and other Viewdata services.
- Reverse V23 allows User run Viewdata service.
- 1200-1200 half duplex for communications.
- XMODEM, HEX and ASCII file transmission.
- Auto Dial of given 'phone number.
- Auto Answer for User's Bulletin Board.
- 80 column terminal with split screen facility.
- Prestel text screen dump.
- Fully BABT approved.
- **FREE Registration to MicroLink.**
- **£6.50 off annual Membership to Micronet, Prestel and Telecom Gold.**

The Apollo is attractively finished in matt black. It opens the doors to world communication to both, the Hobbyist and the Professionals alike. With baud rates varying from 300/300 Originate and Answer, 1200/75 and 75/1200 full duplex and 1200/1200 half duplex, virtually all the popular tele-services can be accessed. A comprehensive Comms ROM oversees the use of the APOLLO, providing simple commands for all the software controlled facilities. APOLLO is an ideal modem for both the first time buyer and the seasoned user. Join the Telecommunications Revolution – Buy a Watford APOLLO!

Only: **£94** **(Carr £3)**
Price includes, the Modem, Comm Software Cables & Operating Manual).
(Write in for full specification)

Nightingale Modem

SPECIAL PRICE to our Customers

£82

(Price includes: Nightingale Modem, Commstar ROM pack & Comprehensive manual)

Nightingale Modem without software	**Only £75**
COMMSTAR ROM package only	**£29**
(P&P on modem £3.00)	

Versatile **BEEB SPEECH SYNTHESISER** Unit

The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £32 (carr £2)

Continued →

COMPUTER CONCEPT'S ROMS

ACCELERATOR	£48
CARETAKER Basic Utility	£25
DISC DOCTOR	£28
Graphics ROM	£23
TERMI	£25
COMMUNICATOR	£49
SPEECH ROM	£24
Printmaster	£24

Wordwise £24

Wordwise plus £40

We are giving away absolutely **FREE**, the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear text-segment area.
- BBC B, B+ and Master compatible.

Only **£24**

(N.B. Word Aid requires a Disc Interface in your Micro)

HI-WORDWISE-PLUS DISC: £5

SPELL MASTER £45

Inter SHEET ONLY £37

CHART ONLY: £26

Inter-WORD £39

MEGA-3 ROM

Interword, Intersheet & Interchart – 3 in one ROM £85

INTERBASE £55

All Prices Exclusive of VAT

VIEW

VIEW WORDPROCESSOR 2.1	£35
VIEW 3.0 ROM	**£48**
VIEW PROFESSIONAL	**£79**
HI-VIEW (for use with 6502 2nd Processor)	£36
VIEW Printer Driver Generator (Please specify Disc or Cassette)	£9
VIEWSHEET (Acornsoft)	£37
VIEWSTORE	£37
VIEWSPELL with 80 track disc	£29
VIEWPLOT Disc (Please specify for Master 128 or Compact)	£22
VIEW-INDEX	£12
OVERVIEW Packs 1 & 2 for the Master	£75

Watford's own Sophisticated VIEW PRINTER DRIVERS

Epson FX80 & Kaga KP (Disc)	£8
Juki & Brother HR15 (Disc)	£8
Silver Reed Printers (Disc)	£8

Micros in Business (Disc)

An introduction to Business software for the BBC Micro from Acorn £43

ADVANCE COMPUTER PRODUCTS' ROMs

Adv. Disc Toolkit	£29
Adv 1770 DFS for Mast/Compact	£29
Adv 1770 DFS for BBC/BBC+	£29
Adv Disc Investigator	£24
Adv. Control Panel	£29

MINI OFFICE II

Disc Version	£14.50
ROM Version	£47.00

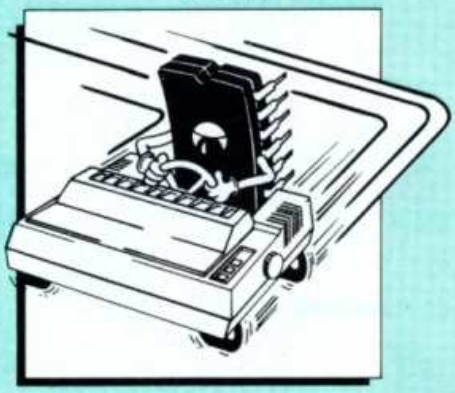
REPLICA 3

This new improved REPLICA 3 from Clares is a very powerful disc based TAPE to DISC Utility. It now transfers even more programs than ever before. Replica 3 will not work with all programs but then neither will anything else. 30,000 Replicas have been sold to date. It has to be good.

£13 (40 or 80 track)

Acorn's Speech Synthesiser package, complete
Special Offer £18

VIEW PRINTER DRIVER ROM



View is a powerful word processor, but until now has seriously lacked in terms of printer support. With the launch of our Printer Driver ROM, which includes an extremely powerful and easy to use Printer Driver Generator, View users can find themselves in the realms of advanced word processing only at a small outlay.

The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, FX, LX, JX80 range, HI80, KP810/910, PW1080, JP101, HR15, M1009, GLP, Panasonic KX-P1081/2, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redefinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute * command when printing.

Other features include a very powerful on screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips. (Write in for a detailed leaflet).

Price: Only £33

Harness the full potential of your Epson RX or FX printer. The NLQ ROM makes Epson printers produce Near Letter Quality output with optional proportional spacing, enlarged and underlined. Accessed by simple * commands from Basic, Wordwise and View (with driver) or almost any other language.

(Send an SAE for sample printout)

Only: £25

VIEW PRINTER DRIVER for NLQ ROM £7

DUMPOUT 3

A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including full Mode 7 graphics.
Also provided are window setting utilities and OSWORD calls to plot and read Mode 7 graphics pixels.

Facilities:

- Vertical and horizontal scaling in all graphics modes and mode 7
- Rotation of image by 90, 180 or 270 degrees
- Left hand margin setting
- Screen dump window setting
- Colours appear as grey scale
- Two tone fast dump
- Colour mask
- Mode 7 contrast expansion
- Mode 7 contiguous dump
- Key triggered and User Port triggered dumps

The Micro User Feb. 1985.
'Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC Micro . . . it must represent excellent value for money and surely cannot be beaten".

For use with the following printers:

GLP, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, M1009, NEC PC8023, DMP100/200/400, Panasonic KX1081/82, Mannesman Tally and compatibles.

Only: £25

BBC SOFTWARE'S Popular Educational Software

- Maths with a Story 1 (Cassette). 4 primary level maths programs **£9.95**
- Maths with a Story 2 (Cassette) 4 further maths programs **£9.95**
- Picture Craft (Disc) 6 - 14 age group. Pack consists of flexible geometrical design & colouring programs **£17**
- WAVES: Science Topics (Disc) CSC O Level Physics program. **£14.95**
- RELATIONSHIP: Science (Disc) O Level Biology program. **£14.95**
- BONDING: Science (Disc) O Level Chemistry program. **£14.95**
- ELECTROMAGNETIC SPECTRUM (8 Discs) O Level program. **£14.95**
- ELECTRONICS IN ACTION (Disc) O Level program **£14.95**
- NEWTON & THE SPACE SHUTTLE (Disc) O Level program. **£20**
- ECOLOGY (Disc) O Level program. **£20**
- POLYMERS (Disc) O Level program. **£20**
- Clasification & Periodic Table O Level. The suite is supplied with its own database of chemical elements which can be classified according to your own rule. **£20**
- FOOD & POPULATION (Disc) O Level program. **£20**
- MICROTECHNOLOGY (Cassette) O Level program. **£6.95**
- A VOUS LA FRANCE (2 Cassettes) A French language home study aid. **£17**
- DEUTSCH DIREKT! (Disc & Audio Cassette) **£20**
- Modem Master (Disc) **£11.25**
- ADVANCED TELETEXT SYSTEM **£9**
- PERIOD TABLE SOFTWARE **£20**
- USING YOUR COMPUTER (Cassette) 8-12 age **£24**
- Astronomy – Primary Disc **£11**
- Computers at Work – Primary **£16**
- Introducing Geography – Primary **£16**
- Electric Fields 6-14 years **£10.50**
- Statistics A level **£23**

THE NLQ DESIGNER

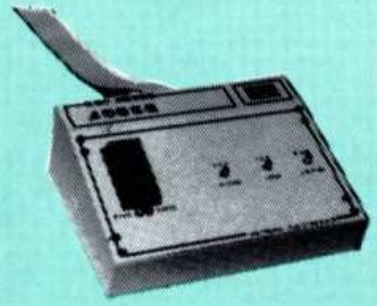
(The First & still the Best)
Supplied with over 25 Different fonts

A massively useful utility for users of the Taxan/Kaga KP810/910 or the Canon PW1080. This program allows you to define NLQ character sets to download into the printer's memory. Full on screen editing of the font. Requires 6264 RAM chip to be fitted in the printer.
Supplied with disc containing over 25 example fonts. (Please specify 40 or 80 track when ordering.) Fonts are: Italic, Courier, Courier Italic, Script, Copper Plate, Shadow, Bold, Double Print and Gothic etc. (P.S. This ROM is not suitable for Epson printers.)

- NLQ Designer ROM, FONT Disc and Manual **£25**

(Write in for further details on all above ROMS)

ADDER



The only low cost EPROM Programmer for the BBC Micro that will program both the standard 21V and the new 12V5, 27128 EPROMS.
Adder is the ultimate EPROM programmer for the BBC Micro. It will program many different EPROMs up to the very latest 27256 32K devices.
The Adder unit connects to the User Port and draws its power from there too. The EPROM is mounted in a top quality ZIF socket. There are no switches or controls as Adder is entirely software controlled.
The Adder software provides sophisticated facilities for programming EPROMs from a RAM image produced by loading disc files. The software is menu driven and designed for ease of use.
Features:

- Two ultra fast programming algorithms or standard slow algorithm.
- Supports standard 21V programming and newer 12.5 volt EPROMs. (Software switched).
- The RAM image to be programmed can be built up in many ways. Sections of image can be loaded separately. Part programming. Read EPROM. Edit data in memory.
- Automatic processing to handle a list of files to program into the EPROM.
- Automatic disc buffering to allow programming of 32K 27256 devices from a 32K file without extra effort.
- Verification gives detailed error list and checksums are maintained. There is also a blank check facility.
- Works with all standard filing systems. Generates header code for RFS ROMs to allow Basic programs etc. to be stored in EPROM. More than one file per ROM permitted.
- Programs the following EPROMs: From 2K to 32K: 2516, 2716, 2532, 2732, 2764, 2764A, 27128, 27128A, 27256 (Both 12.5V and 21V).

£75 (£3 Carr)

TEX EPROM ERASERS

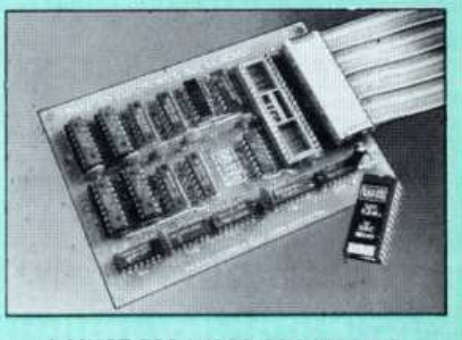
EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

- **ERASER EB** – Standard version erases up to 16 chips. **£28** (carr £2)
- **ERASER GT** – Deluxe version erases up to 18 chips. Has automatic safety cut-off to switch off the UV lamp when opened. **£30** (carr £2)
- Spare UV tubes. **£9**

32K

SHADOW RAM- Printer Buffer

Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B Plus or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.
- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.
- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This product is recommended as an ideal complement by Computer Concepts.
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32K £17.35 128K £43.40

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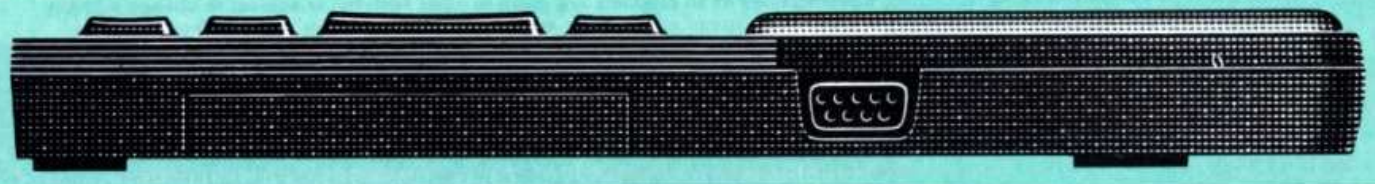

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WATFORD WINCHESTER

The Watford Way... Watford Electronics' hard disc – at an affordable price!

The Winchester disc has always, sadly, been beyond the budget of most home users – being comprised of precision mechanical and electronic devices, the hard disc (as it is also known) has been mainly reserved for businesses and scientists for far too long.

That is until recently; Watford Electronics – with ever an eye out for the serious Beeb user really have outdone themselves this time, they have produced a 30 Megabyte Winchester disc, with its own power supply, a set of utilities (supplied on an ADFS Floppy disc) and an ADFS ROM for little more than the price of a Master series machine!

Watford's bundling of the Acorn ADFS chip with the Winchester is probably more of a statement than a gesture, as it obviously lays to rest the big question of its ADFS and Acorn Winchester compatibility. On the surface, this may not seem too important, but as we shall see later, it is very important that such a potentially popular hard disc *is* compatible with both the generic Winchester drives and the Acorn product.

Product Perfect

I do not normally have to justify the way I review a product; suffice to say that the products must speak for themselves – or not speak at all! But in Watford's case I am prepared to make a precedent and review the unit on two levels: The first is on the level of the home user, the second is naturally enough at the business level; both have their individual requirements and both require different reasons for buying such a device.

Firstly, many people have asked me "is the Watford Winchester a replacement for a dual disc system?", and my answer is a hearty yes! Your maximum requirement *if you are using all approved Acornsoft titles* will be a single 80 track disc drive. The ADFS is capable of handling all of the necessary switching between an ADFS floppy and the Winchester, and it will ease the burden (and the consumption) of your floppy discs quite considerably.

So, what does it look like? Well, the 30 Megabyte drive includes its own power supply and is 21cm (wide) x 9½cm (high) x 35 cm (deep), it is finished in BBC beige, and is manufactured in metal; quite a sturdy beast I grant you, and this is a good thing considering the fact that this Winchester is just about affordable for schools, and is certainly affordable for universities and colleges as either a companion to an individual Beeb, or as a much needed booster for an Econet system (taking it from level 2 to level 3).

The disc itself is a small "half height" drive with a red LED on the bottom left hand side of the front blanking plate. Upon switching the unit on from the power switch on the left hand side of the drive, it takes almost 12 seconds to properly reach speed, when it does, the thing bleeps at you in much the same way that my IBM PC next to it does!

On the supplied floppy disc (and one of the first things you should transfer to hard

disc when you boot up the system) are utilities including Format, Verify, Copy files (a useful utility enabling users to transfer files between DFS discs and ADFS Winchester/ Floppy) and a great little program that puts 1000K of Winchester disc onto a floppy.

The Winchester at Home

Having a Winchester drive at home may be considered to be a bit of a luxury, but for general everyday book keeping and home accounts, it is invaluable; For personal records and a database, I found that the Winchester eats up all of my 53 ADFS discs with ease.

Winchester based ViewStore filing operations are vastly improved so that reading and writing files are almost instantaneous – ViewStore has a penchant for using the OSBPUT and OSBGET routines so that it is ADFS and 6502 Second Processor compatibility – using an ordinary DFS disc is very slow for most serious applications and it is a good feeling to get most of my database work done in ten minutes, when a floppy would have done it in half an hour!

ViewSpell and View feel more integrated than before. True, you have to SAVE a file from VIEW, change into Viewspell then LOAD the file again, but the difference is that where a DFS based Viewspell traditionally took 3 minutes or so to check a 3000 word document, the Winchester rockets though the text in about 20 seconds or less!

Of course no home application wouldn't be complete without trying out a few games; naturally most of the unprotected games on disc will work, but most of the protected will not transfer. I am, of course, talking about the recent batch of Superior Software/ Acornsoft games. It is a shame that none of the protected discs will transfer, but then it will at least give you some excuse for using a floppy disc drive.

That the Winchester drive is ADFS compatible also enables the user to connect the drive to an Econet system – it is totally compatible with Econet, I was waiting on a 1MHz bus/BBC podule for the Archimedes, but it didn't arrive in time for this article so I will have to come back to you on the question of Archimedes compatibility – watch this space.

At work...

The ADFS has proved itself as a useful allround tool in the office Being compatible with the Master 512 and the Acorn Z80 Second Processors.

The ADFS has a very useful way of partitioning different hardware configurations using the Winchester. For example, both the Master 512 and the Z80 coprocessors partition the Winchesters as individual root directories. This is in much the same way as the old Acorn CP/M discs for the Z80 Second Processor are readable as they use the standard DFS directory to store one very large file called CPMDISC. This is almost the same case for the Winchester except that the CPMDISC file is longer and needs to be part of the root directory "$" (as is the case with the DFS format).

Whilst CP/M is quite a workable operating system in the office, it really has graduated to being a great little operating system for the home – and with literally thousands of serious applications packages – including *Wordstar* and languages such as *FORTRAN, LISP, COBOL* (of course) and even full implementations of *"C"*, CP/M looks set to have a long a fruitful life now that it has been ousted by MS-DOS in the office.

CP/M on the Winchester disc is a revelation; it just goes to show that by standardizing an operating system down to the type of floppy disc drive you use, it is going to seriously impair the performance of a computer system *only by its use of the hardware*, a Beeb based CP/M system is fast, efficient, and with considerable memory advantages over that of a standard BBC Model B (and even a Master 128), the software can, in my opinion, outperform a great many BBC dedicated software titles, and some MS-DOS ones as well.

Of the packages I had for assessment, Wordstar worked the best. Being Disc based instead of memory based, this package is really slow if you are using the old Olivetti-based full height drives – things aren't much better if you are using half or even quarter height drives, I am afraid that from now on CP/M will never be the same using a standard floppy setup.

The Master 512 is altogether a different beast, this uses a "null" directory which is only readable once you are in the Master 512's DOS Plus operating system, or the GEM environment. To be quite honest, GEM is only really useful when working with a hard disc. The amount of disc swapping can be annoyingly frequent, and if you are using the bundled GEM packages requiring fonts and multiple files, printing out from GEM Write is a revelation to anybody used to the constraints of using a disc drive.

The Watford Winchester also effectively doubles the existing software pool open to 512 users as most of the best PC packages and applications make use of an IBM PC Winchester.

Construction and Benchtests

The Winchester unit has a built in fan and is a quiet one! Working in an office should prove no problems as it gently forms part of the background hubub. In the home, the fan is audible, although, but just barely!

One of the most important parts of the review must be the benchtest, and for consistancy, I decided to use the ones used by Allan Rolfe in April 1987's A&B Computing; these are comparative tests devised by Jim Notman for *The Micro User* magazine, and are faithful programs, even though they are generally designed to measure the operating filing system and not the media.

Another detail is that not all BBC Micros and Masters run at exactly the same speed! This is quite easy to explain; The Master has a more efficient memory chip set and uses a CMOS 6502 processor variant, whereas the BBC Micro has a different set and a standard 6502. Hardware devices such as ROM and RAM boards and even the User Port status or the Tube interface can affect the performance of a machine under test, so this may be why some of the benchmarks may vary from machine to machine.

Conclusions

The Watford Electronics 30 Megabyte Winchester disc drive surely has to be one of the best value for money products currently out for the BBC Micro and Master series. It is fast, efficient, small, quiet, and affordable. Its price tag of £449 (plus VAT) is amazing, truly an affordable product, and at present, I think only Watford Electronics are capable of doing this.

The Acorn 30 Megabyte drive costs £1520, but this includes the Econet level 3 software. File Store E02 costs £825, whereas the File Store E01 costs £705 – with this sort of competition I don't think Watford will have any trouble wrapping up the Winchester market.

Clock another success Watford!

Factfile

The Watford Electronics 30 Megabyte Winchester disc drive costs £449 (plus VAT) as a special offer. The package includes an Acorn ADFS ROM and documentation.

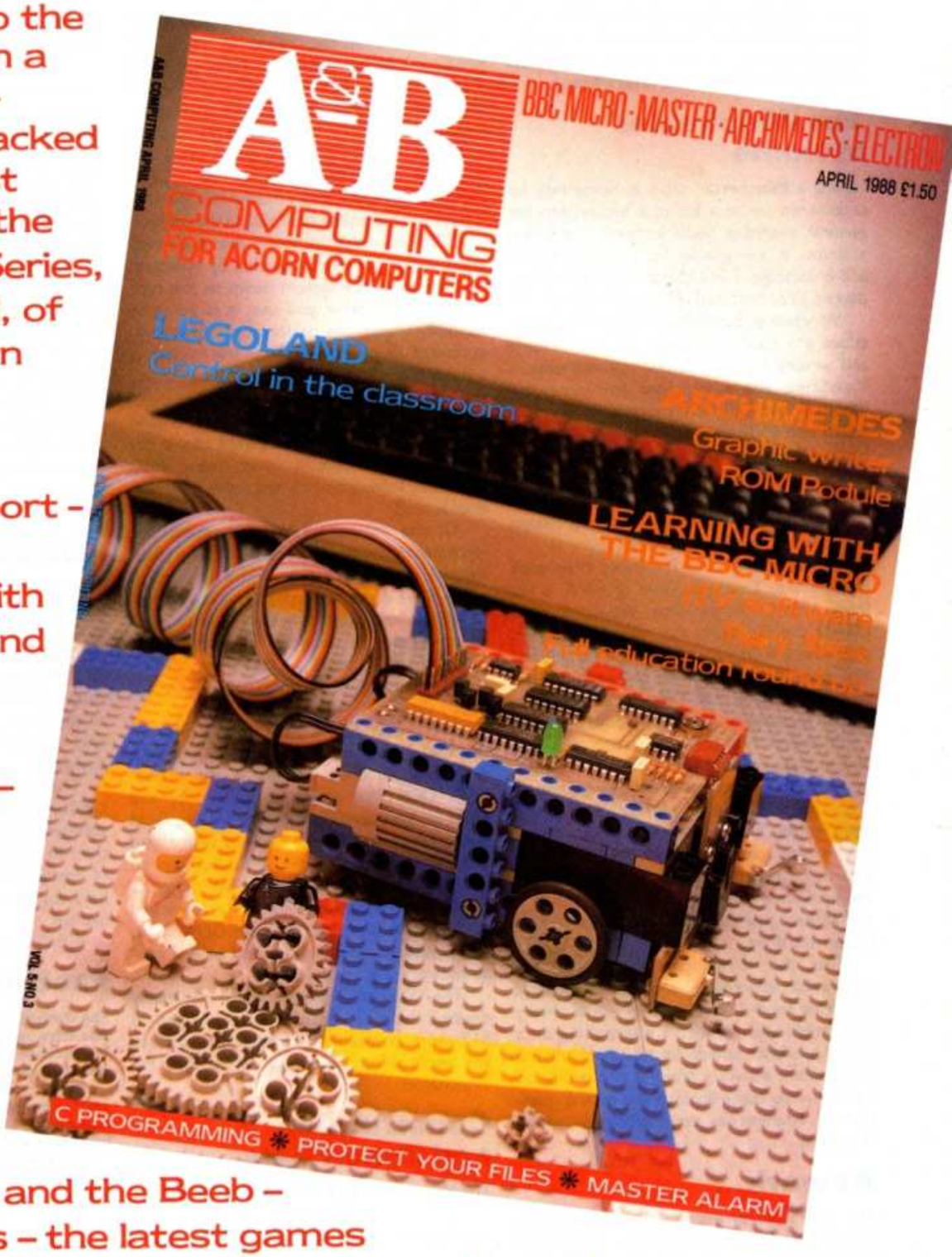
Bundled software includes all the standard utilities including Format, Verify, Copy, and a high density 1000K per disc archive. A Winchester disc editor is also included.

For more information contact *Watford Electronics, 250 Lower High Street, Jessa House, Watford, Herts.* ☎ (0923) 37774.

No	Benchmark	DFS	FLOPPY	VIGLEN	WATFORD
	*SAVE 16K	2.07	2.18	0.32	0.38
	*LOAD 16K	1.79	1.58	0.21	0.25
1	OPEN and CLOSE 1000 files	7.26	17.49	17.17	23.17
2a	Print 1000 numbers	8.40	11.90	5.30	4.83
2b	Print 100 strings	40.63	47.18	17.42	12.82
3a	Input 1000 numbers	8.20	7.58	3.92	3.23
3b	Input 100 strings	22.40	21.60	15.24	11.20
4	BPUT 1000 bytes	2.78	6.32	3.62	2.41
5	BGET 1000 bytes	1.78	2.99	1.46	1.54
6	Move PTR 1000 places	1.63	6.83	5.44	5.92
7a	Write test relative file	42.02	50.58	18.64	13.90
7b	Read test relative file	23.20	23.47	15.82	12.10
8a	Write relative file backwards	101.08	64.07	20.19	16.07
8b	Read relative file backwards	42.82	30.15	16.03	12.06

SPRING CLEANING!

A&B springs into the new season with a new cover logo – April's issue is packed with all the latest news regarding the BBC B, Master Series, the Electron and, of course, the Acorn Archimedes!



In A&B:

Archimedes Report – way ahead of everyone else with Graphic Writer and the new ROM podules.

C Programming – plenty of useful hints and tips with this powerful language.

Also in this issue!

The Lego buggy and the Beeb – Communications – the latest games reviews – news – features and much much more!

A&B Computing, for Acorn Computers – and for you.

Out on March 6th

Jon Vogler

Down to Business

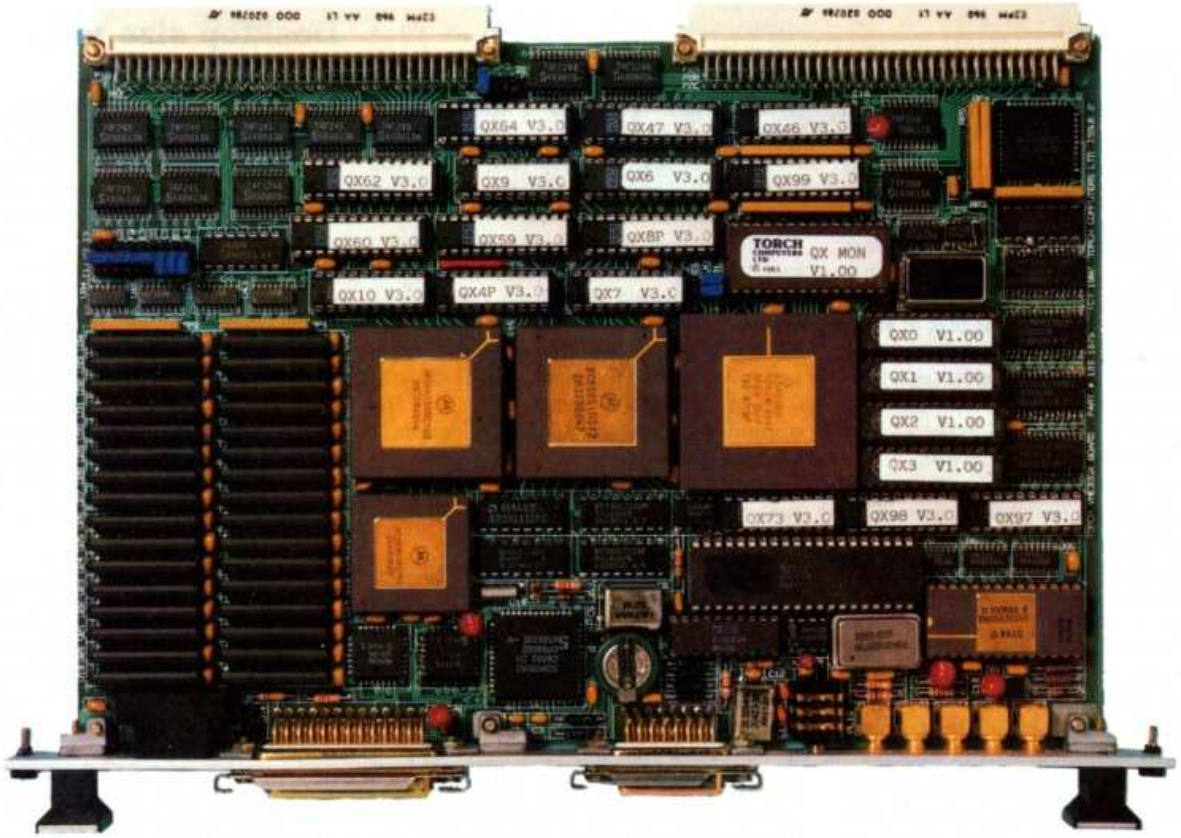
ATX TRACK

Torch's *Advanced Triple X*

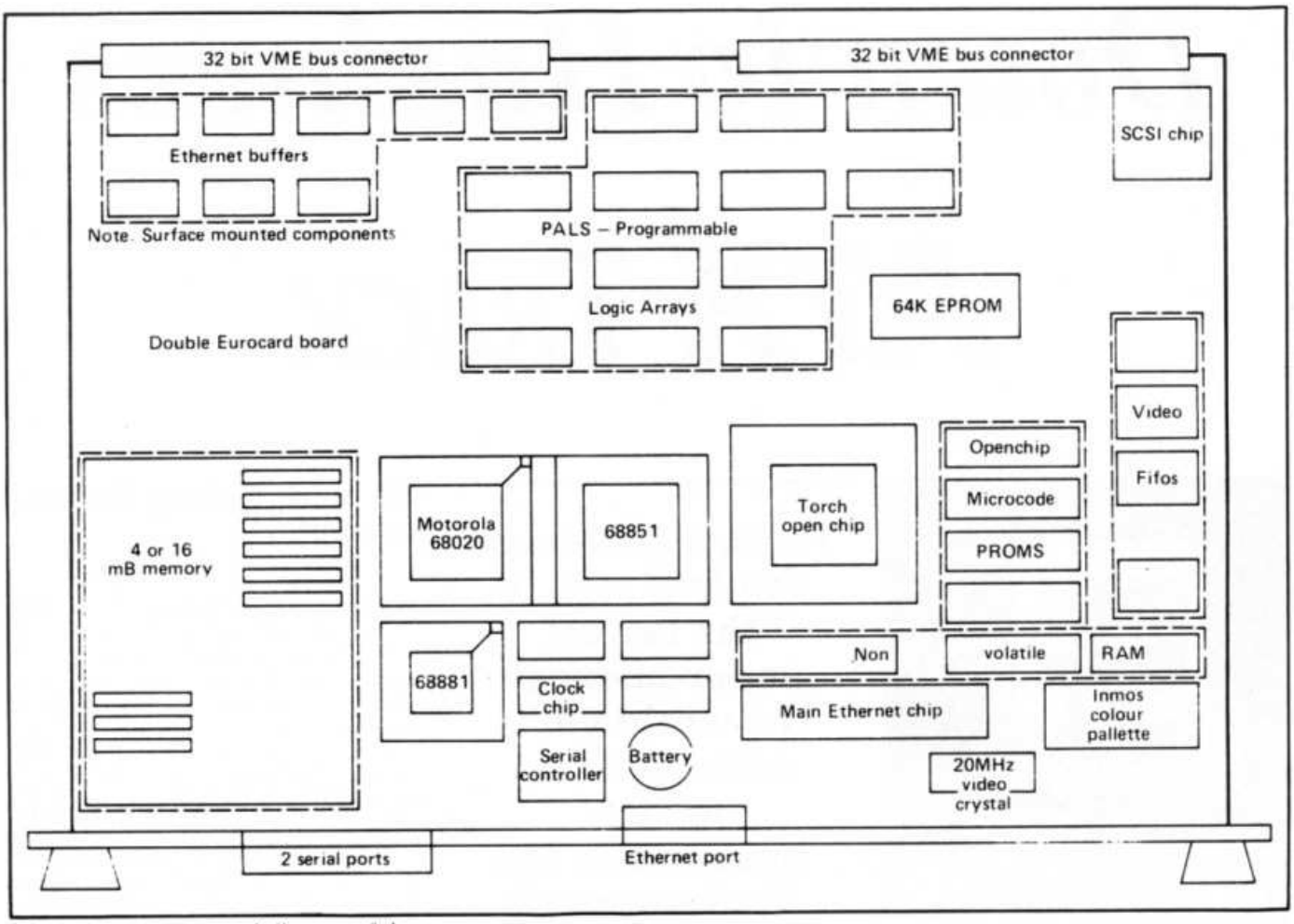
Torch's *Advanced Triple X* may be the fastest super-micro in the world yet is affordable by modest businesses. Jon Vogler reports

No more waiting for the computer

Have you ever visited computer professionals at their place of work, at a research lab or some big multi-national company, and felt envious that they have access to almost unlimited computing power: *VAX* or *Prime* minicomputers that complete, in seconds, tasks that would take your machine several minutes; that effortlessly drive arrays of big colour screens; changing the display faster than you can read it. You remember, ruefully, how long you sit, gazing blankly at your little screen, waiting; waiting; waiting for a file to load, a calculation to complete, a database to complete its search or an accounting package to re-sort your audit



An amazing piece of miniaturization: the *ATX* board (approximately full-size)



Principal components and diagram of the *ATX* board

trail from date order to cost-centre order, while your accountant stands patiently by, unimpressed but clocking up the minutes at your expense!

Or perhaps you have been demonstrating to a customer, whom you need to impress that you are a progressive company, the *"Wonderful things our computer can do; so much quicker ...."* and the brute seems to have frozen solid, leaves you feeling a proper idiot, eventually completes the task in about twice the time it would have taken with pencil and paper on the back of an envelope.

Exaggeration? Sure, but with grains of truth in it. If you doubt it, make a check yourself. Next computing session, use a stop-watch (or count seconds: "One thousand, two thousand, three thousand" to see how many per one-hour session, are actually spent, sitting, staring, waiting for the machine to churn on. Then cost it out, at your personal cost-rate, spread over a working year. If you are an intensive computer user, as well as a business-person whose time is the main constraint on your business's profitability, you will be staggered; the cost runs into thousands of pounds.

Then take the business of multi-tasking. You finally bought a machine with a graphics "desktop": *GEM* or *MS-Windows*, so you could interrupt work on one job to check another file, make a memo or do a calculation. Great, no need to load and unload files but what do you find? The screen window you need is always on the bottom, hidden by some huge word-processor text or spread-sheet. Yes, you can get at it, eventually, just as you can get at any piece of paper on your desk but, if only the desk were bigger, with space to keep four full-size documents open at once! If only you could flick from one task to another with a mouse-click that did not embed the rest under a stack of overlapping screen windows. You have seen it done at Computer exhibitions, or in the computer-aided design (CAD) centre at some university but, at £50,000 per installation, it seems a dream, reserved for super-rich companies, exclusive to high-tech industries.

Well it is not! It is available, this year: awesome computing speed and power, yet easy to use; huge colour screen, huge memory, huge disc storage, yet in a box about the size of a *BBC* or *Master* at a price even a small company can contemplate, around £6000, equal to a secretary's wages for less than a year. It is made by a Company that, three years ago, was only known for making neat second processors for *BBC Micros*. It is Torch's *Advanced Triple X*; *ATX* for short (Figure 1).

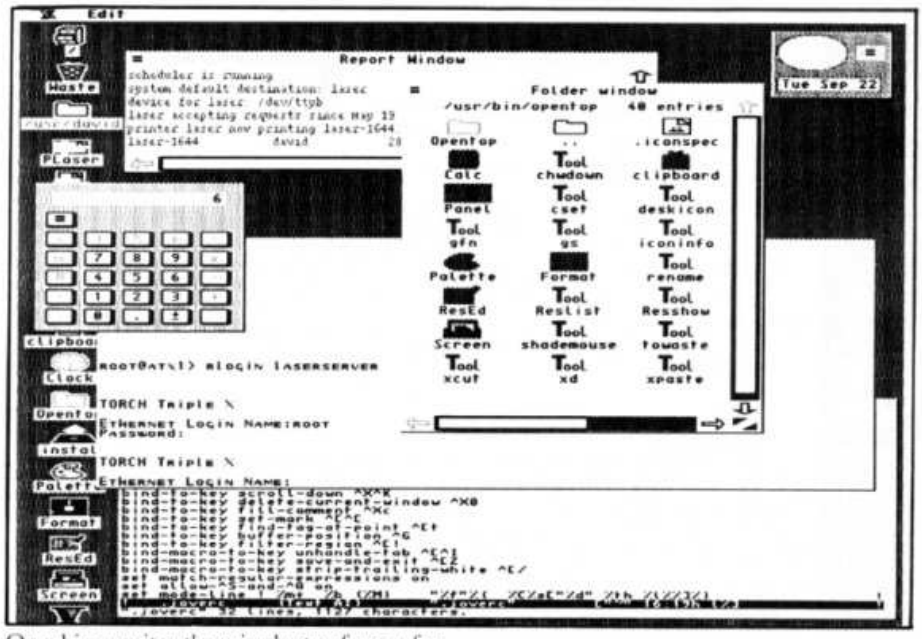
Desktop size yet powerful

Last year, computers of comparable power were either full-size minis, that sit and hum in a special air-conditioned room, with their personal mains power-supply and an army of technicians on call to minister to their needs, or else were "desk-side" super-micros, contained in a two-foot high cubicle, that needs yards of thick cables to its terminals and floor-space of its own. The most powerful machine in IBM's new *Personal System-2* range, the *Model 80*, is such a creature. The system unit weighs half a hundredweight! Yet the *Advanced Triple X* (*ATX* for short) has equivalent power and facilities. It contains, within a five-inch high desktop work-station, the following components:

- The power supply
- A floppy drive; currently 720 Kbytes but Torch are evaluating larger capacity units, up to 20 megabytes per floppy, and are also considering whether or not to supply the *ATX* with tape-streamers rather than floppies as the standard data input and output device. Although one is available, I have not so far invested in a streamer-tape unit but currently back-up my *Triple X* onto some thirty floppy discs: a tedious two-hour job that could be done, in the

early hours of every morning onto a fifty or sixty megabyte, quarter-inch removable tape cassette.

- A Quantum eighty megabyte hard disc, with an "access time" (the time to find any data, anywhere on the disc's surface) of only twenty milliseconds. Eighty megabytes represents as much data as can be contained on **two-hundred** BBC Micro double-sided, double-density, 80-track floppies! To put it differently, eighty megabytes is about ten volumes of the *Encyclopaedia Britannica*: with every word of them accessible in one fiftieth of a second!
- A 32-bit *VME bus*: basically a 32-lanes each way data-motorway along which data to or from any outside source such as:
- An additional disc-drive that ran at higher spension cards are now becoming available: in theory the *ATX*'s 68020 chip can address up to 4 gigabytes (4,000 megabytes) but, in practice, a *VME* rack holding say 10 such cards seems a more likely maximum: a mere 160 megabyte expansion!
- Any technical device to which the *ATX* might be "hooked": for example "analogue-to-digital" cards for measuring scientific experimental data or "frame-grabbing" equipment to take the goal-scoring moment from a video-camera and, while the viewers are still gawping, distort, colour, emphasise or otherwise alter it and put it back on the screen.
- Last, but at the very core of the *ATX's* advanced technology: the remarkable main board.



On a big monitor there is plenty of space for working windows, screen accessories like the clock and calculator, and extra icons

Workstation power on a single board

In the past the "logic" of sophisticated computers was spread between a number of separate printed circuit boards: often a main board, mounted flat, bearing edge connectors into which slotted subsidiary boards: for memory, communications, networking, serial and parallel interfaces, auxiliary processors, video control (with additional boards for extra colour or resolution). Each board had to communicate with the others, often via the main board: an elaborate business which frequently deflected the main board from performing its primary tasks.

In the *ATX*, in contrast, the entire work-station ("work-station" is in-jargon for a powerful desk-top computer), complete with all its communications and peripheral interfaces, is contained on one double-*Eurocard* board, 223 mm by 160 mm or just over half the size of this page (Figure 2).

There are important physical benefits from such compactnes. I have described how the *ATX* can sit on a desk, whereas competitors have to stand beside it. Other benefits are that power consumption is less, so less heat is generated and less cooling-fan power is needed, making it quieter. Portability is increased. Torch were proud thas on the Formula 1 race-track, to keep their cars tuned to a pitch of perfection throughout, not just before a race. Imagine lugging sme huge machine around the pits! Perhaps the greatest advantage of compactness is for the "system integator" (manufacturer of electronic equipment that combines several separate products, such as power-station or factory-process control systems) who requires a high performance *UNIX* computer built-into their product, and now needs only to provide space and connetors for a single board within their box.

As well as the power they get full communications facilities and the sympathetic *OpenTop* regime (described in *A&B Computing*, July 1987), with which they can make their own system software friendly to the user. Small is undoubtedly beautiful in advanced computer development but the *ATX*'s performance also gains hugely from miniaturization. Let us explain these benefits and how they have become possible. Even if you are not one of the happy band who can justify buying an *ATX* on the grounds of improved business productivity, the story of the *ATX* main board is a classic of modern computer engineering. The story you are about to hear (as the movie-moguls would put it) concerns the true leading edge of technology (as the advertisers would put it).

Specification of the main board

The *ATX* uses a Motorola *68020* 32-bit main processor chip, currently running at 16.7 megahertz (16.7 million cycles per second), later to be accelerated to 20 MHz. A Motorola *68881* co-processor deals with large-scale, floating-point, number crunching. The *68020* is currently served by 4 megabytes of memory, in the form of 32 one-megabit chips, mounted edge-wise on the same board, and this will be expandable to sixteen megabytes when four-megabit memory chips become available shortly. That represents five-hundred times the memory of the *BBC Micro B*! Also on the board are the *SCSI* disc and tape interface, the full thirty-two bit *VME* bus, twin serial channels, each supporting X25 (for digital communications such as British Telecomm's *Kilostream* and *Megastream*) and a controller for a VDU screen of up to 1024 by 768 pixels (picture elements or screen dots), using up to 4 bits per pixel for colour.

Exceptional speed

It is exceptionally fast: even with the clock (the crystal that "marks time" for the main processor) speed held down to 16 MHz it was bench-marked at 3558 "dhrystones" per second and this will increase as clock speed goes up. Dhrystones per second is one of varios speed measurements for computers. Rather than try and explain its meaning let us compare the equivalent bench-marks of other computers: I do not have figures for a BBC Micro; perhaps no-one has ever thought it worth measuring. However an old Apple 2E did some 37 dhrystones per second and an IBM PC-XT about 259 dhrystones per sec. An Atari 520ST does 450 and an Apple Macintosh and a standard Triple X 625 dhrystones per second. The new Acorn RISC chip, used in the Archimedes, rattles along at 2147 and the IBM PS/2 Model 80 manages 3125 and the new Macintosh 2 2083 dhrystones per second. A really powerful mini-computer, DEC's *VAX 8600*, is bench-marked at 6423. So you see the ciass in which the *ATX* finds itself! To illustrate speed in a manner easier to imagine, the *ATX* can transfer over three-quarters of a megabyte of disc data per second. Think of

You can display several full-size text windows simultaneously

it this way; it could copy the entire contents of this issue of *A&B*, pictures, adverts and all, from disc into memory in about half a second! Speed has other virtues. Even with a big, nineteen inch, colour monitor (Figures 4, 5 and 6) almost large enough to display a double A4 page full size, the user enjoys extremely rapid screen updating.

Principles of design

This performance, from so miniscule a unit, is achieved by the following design principles. (Here we shall inevitably become rather more technical than one would wish. Sory; read on on the principle that, if you do not understand it, I probably do not, either. I hope Figures 2 and 3 will serve as a map; one can travel around the country even if you do not understand its underlying geology, sociology or language!)

The co-processors (one for doing arithmetic; the other that manages the memory) are treated as united with the *68020* main processor chip.

Peripherals and other circuits (even external ones) have direct access to the main memory, withoutinterupting the main processor. This is the equivalent to being able to open your boss's filing cabinet without having to get him out of a meeting to ask if you may; obvious really.

Reduction in the number of deviceswhich use the main processor bus keeps bus traffic simple; just as a country road with only a few houses along it has less complex traffic than a city centre street.

Elimination of "discrete logic devices"; individual chips that contain, mainly, "gates" – switches that allow the current (ie the binary signal) to go one way or another. Where has the logic all gone? Ah! That is the clever bit. Keep reading!

Extreme board compactness, achieved by techniques such as surface-mounting of components (instead of drilling the board and inserting the component wires through it, as on your *Beeb*), keeps data paths and component count to the absolute minimum.

The main processors and the *OpenChip*

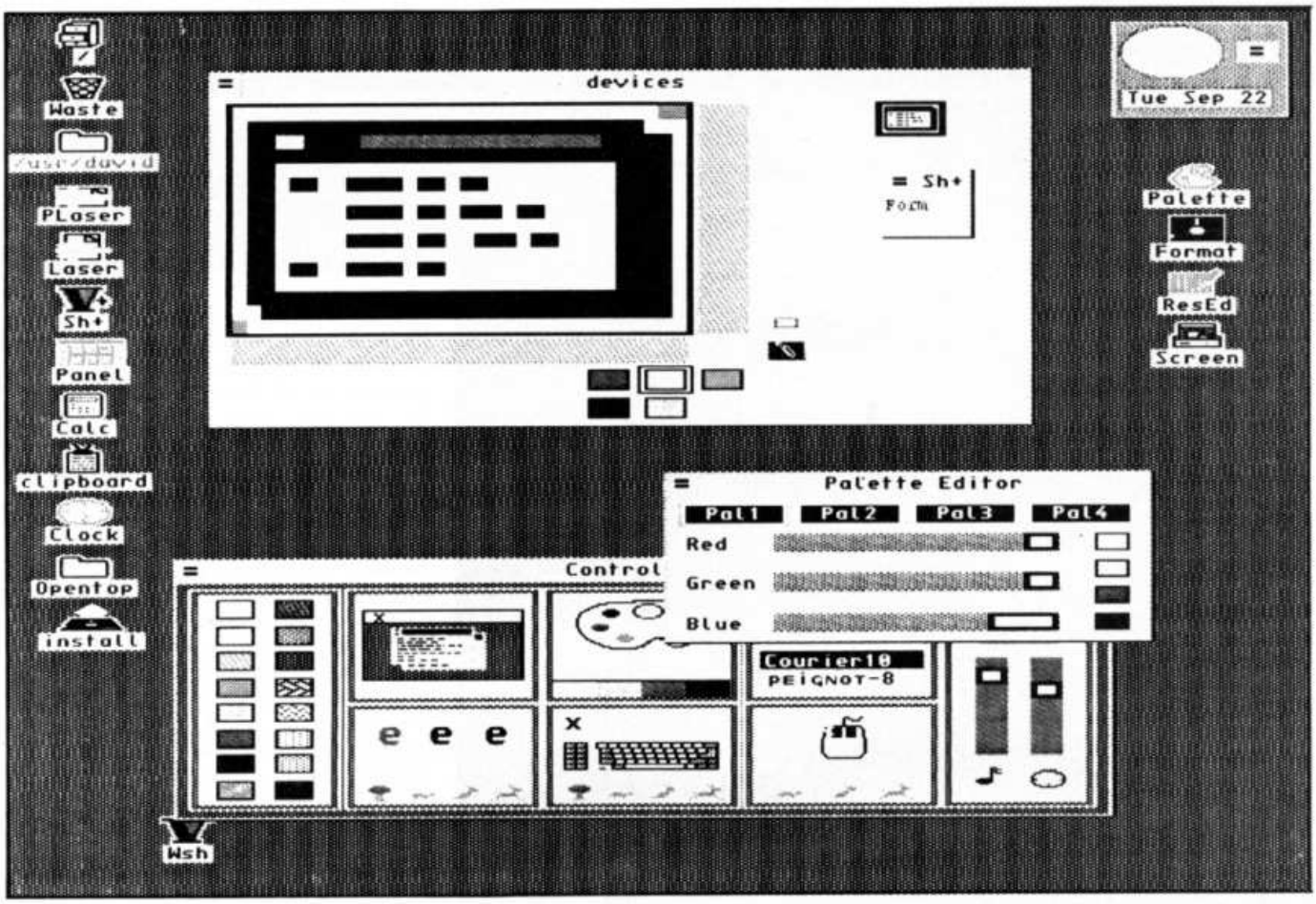
Motorola's 68020 chip possesses special instructions for co-processors, which are virtually treated as if they were on the same chip. On the *ATX* the *68020* main processor, the floating point arithmetic unit and the *68851* PMMU (paging memory management unit) appear, to the rest of the board, as a single unit. Instructions can pass between them without the delays which would occur if they communicated via a bus (like three offices in the same building, rather than spread out along a busy city street). However such benefits arise from the processor design, so are available to *all* 68020 users; what makes the *ATX* unique is the *OpenChip*. Torch have collected together all the discrete logic required around the board and amalgamated it on a custom-designed "compact array" of no less than 18,000 gates on a single chip (Figure 7); an amazingly intricate piece of design. Called the *OpenChip*, its main tasks are to control the video (monitor screen) display and give both the video, and all the other eight-bit devices (such as the *SCSI* controller that manages the disc drives, the *Ethernet* network controller, the controller of serial ports and the battery backed clock) direct access to the main memory. This prevents them perpetually interrupting the main processor operations. In effect the *OpenChip* marshals them and only allows them to interrupt the *68020* group at regular and convenient intervals, like a bossy secretary who guards his boss from constant interruptions by grouping visitors to see her at specified times. Their eight-bit data is "buffered" (marshalled together) into thirty-two bit portions before being allowed onto the processor bus, so that the processors can get the same volume of data in one quarter as many read operations.

Controlling the screen

The manner in which the *OpenChip* controls the video is particularly important. It reads data from the main memory in "block mode" and places it into four video "fifos". Block mode is an economical method of referencing memory. Normally a memory reference must specify both the "page" and the "offset" (the position on the page) once for every read cycle: three clock cycles in all. However, because video uses large, consecutive sequences of data from the same memory page, only the first reference need specify the page; subsequent ones can assume the page remains constant and increment the offset during the read cycle, resulting in one third as many cycles to read the same amount of data. Also, because data is handled in thirty-two bit (four byte) "long words", fewer accesses are needed to handle the same amount of video data than with the old, eight-bit methods. The combination of block mode with thirty-two bit data handling reduces the amount of time during which the main processor is "locked out" of the main memory because the video is accessing it (which it does regularly and perpetually to keep the screen up-to-date). This enables the processors to run programs much faster.

The "fifo" chips (first-in-first-out like a well-behaved queue in a doctor's waiting room: a fifo handles data in the opposite manner to a "stack", where the **last** plate piled on is taken off first) are the buffers that enable block mode to be used. They serve an additional function, of uncoupling the video and main processor, so that their speeds need not be synchronous. The fifos simply accept the gush of data pumped out by the processors but output it at whatever rate the video needs for scanning, "catching up" when the processor turns its hose on some other device. Fifos of such speed and size have not formerly been available; Torch had to obtain the early production output from the newly-emerging high-resolution digital television industry; an interesting piece of technology industries cross-fertilizing one-another.

From the fifos, data passes through an Inmos colour pallete chip which can use one, two or four data bits to determine the colour of each pixel on the screen. Using four bits, sixteen (2 4) colours can be on the screen at one time, from a total range of 262144 (2 18) shades provided by the eighteen-bit (6 red, 6 blue, 6 green) colour value. As a consequence of its improved video performance, the *ATX* will offer a vertical screen resolution of 736 by 512 pixels in four colours, (1000 by 800 in monochrome), twice



There is a choice of 262144 different colour shades, sixteen of which can be on the screen simultaneously

that of its *Triple X* predecessor (compare this with the standard *Beeb* screen of 640 by 256 pixels.). This extra spread is important when using the *OpenTop* graphics operating system. It will allow several large (80x24 character) windows to be visible simultaneously on a screen desktop (Figures 4 and 5), fifty per-cent more icons to be deployed around the desktop edges or much bigger windows: 132 or 160 columns wide by 60 deep (or even more, because a wide ranhe overall effect of the *OpenChip* is to reduce the number of devices on the main processor bus to, essentially, four: the main processor group itself, the main memory, the *VME* bus interface and the *OpenChip* itself. In addition there are 64 kbytes of EPROM firmware, which holds self-test routines and configuration information. If there were more devices, each would need buffering for bi-directional signals (equivalent to the space at each end of a one-way road-works that says "WAIT HERE UNTIL THE LIGHT IS GREEN"; resulting in far more complex logic, more chips, more wiring, more energy consumption, more cooling and more size! No commercially available direct memory access unit can access so many peripheral devices, using a different interface for each. The *OpenChip* reprograms itself, depending on which device it is talking to, using micro programs contained in four PROMs of 4kb each. If Torch had bought off-the-shelf alternatives, no less than five DMA (direct memory access) chips would have been needed to perform the same tasks and each would have consumed space, power and money and needed supporting logic which would have done likewise. So, despite having no experience (as a company) of micro-processor design, they designed it themselves.

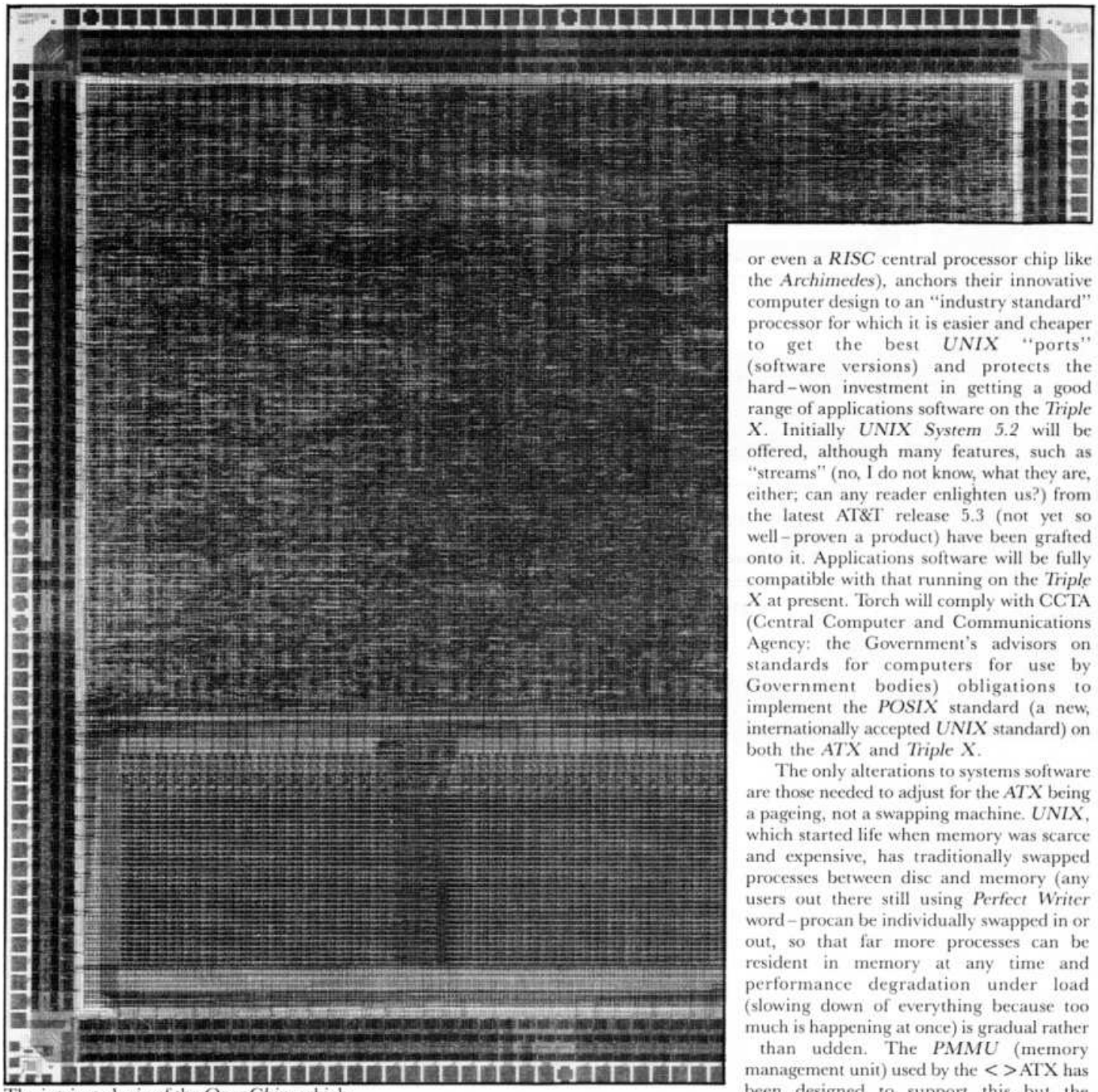
How the *OpenChip* was designed

The *OpenChip*, has "RISC" (reduced instruction set computer) architecture. I shall not explain that in detail because it at the cherry before they are usable: you design it, make a prototype, test it, find what is wrong with it, redesign, make another prototype, until you get it right. However Torch wrote a simulator to enable rigorous testing before design was finalised and the almost unbelievable result was that the *OpenChip* worked, with two minor errors, first time. There was no need to redesign; production could begin straight away. Of the two bugs, one (an extra clock cycle before the *OpenChip* registered a particular signal) could be ignored because the delay was insignificant and the other (Ethernet said a "packet" of data was waiting when it was not and vice-versa) has been overcome in the micro-code (by altering *if* to *if not*: a change whose simplicity demonstrates the virtues of using micro-coded components). Torch reckon they saved £100,000 and three months development time by this achievement.

Off-board peripherals

The *SCSI* interface can handle conventional disc or optical discs or high performance external "disc-like" memory. The floppy disc controller board uses an *SCSI* protocol with "disconnect/reconnect". This prevents floppy disc reading and writing operations from "hogging" the *SCSI* bus, with the all-too-familiar slowing down of operations on the whole computer when a disc is whirring.

Serial ports take the form of two *DUSCC* (dual universal serial communications controller) ports, either of which can be synchronous (data "pulsed": marching in step to a clock beat - like on *Econet*) or asynchronous (not keeping any sort of time but the signals demarcated by identifiable start and stop bits) and there is a digital-to-analogue converter (converts data like "just past half-past-seven" to 7.31 and vice-versa. This limited serial output, one of the product's few shortcomings, is a direct consequence of board compaction; there simply is not space around the board periphery to put any more. However the



The intricate logic of the *OpenChip*, which holds 18,000 gates on an area of less than a square inch

VME bus allows off-board connections to an additional 8 or even 16 serial ports, for multi-user operation, as well as to extra memory so there is nothing to stop you having a desktop computer onto which you can hang ten terminals, two printers, a modem and a few other bits and pieces. The *VME, revision C* bus is a full 32-bit bus, an improvement over the sixteen-bit bus on the *Triple X*.

Sound output

Audio output offers a 64 kilo-hertz sampling rate, with 8-bit resolution. This means that the sound level is sampled 64,000 times a second and the output voltage can be set to any of 256 (28) levels. This may not be quite compact disc sound quality (which uses 12 or 16 bit resolution) but meets *CCITT* digital voice standards. To illustrate: the British Telecomm telephone system (the one everybody hates) has a 3 kilohertz sampling rate, so speech **synthesized** on the *ATX* will be measureably better than a true human voice over the telephone.

Operating System and software

Torch's decision to stay with the well-proven *68020* processor, rather than go for the *80836* or even a *RISC* central processor chip like the *Archimedes*), anchors their innovative computer design to an "industry standard" processor for which it is easier and cheaper to get the best *UNIX* "ports" (software versions) and protects the hard-won investment in getting a good range of applications software on the *Triple X*. Initially *UNIX System 5.2* will be offered, although many features, such as "streams" (no, I do not know, what they are, either; can any reader enlighten us?) from the latest AT&T release 5.3 (not yet so well-proven a product) have been grafted onto it. Applications software will be fully compatible with that running on the *Triple X* at present. Torch will comply with CCTA (Central Computer and Communications Agency: the Government's advisors on standards for computers for use by Government bodies) obligations to implement the *POSIX* standard (a new, internationally accepted *UNIX* standard) on both the *ATX* and *Triple X*.

The only alterations to systems software are those needed to adjust for the *ATX* being a pageing, not a swapping machine. *UNIX*, which started life when memory was scarce and expensive, has traditionally swapped processes between disc and memory (any users out there still using *Perfect Writer* word-procan be individually swapped in or out, so that far more processes can be resident in memory at any time and performance degradation under load (slowing down of everything because too much is happening at once) is gradual rather than udden. The *PMMU* (memory management unit) used by the <>ATX has been designed to support this but the implications are confined to the *UNIX* kernel and will only affect external software insofar as it runs much faster and does not slow down suddenly when many processes run concurrently. The extra speed is not always pure benefit; Torch are seriously considering slowing down the elegant "zooming" of the *OpenTop* windows, so that their impressive visual effect (pulsating rectangles that grow as they move into position) should not be overlooked in the rush!

Availability and price

The *Advanced Triple X* will be available by Christmas 1987 and the board itself will sell for less than £4000. The lowest specification desktop computer, with 4 megabytes of memory and 80 megabyte hard disc, will sell for around £6500 (excluding monitor).

Archimedes

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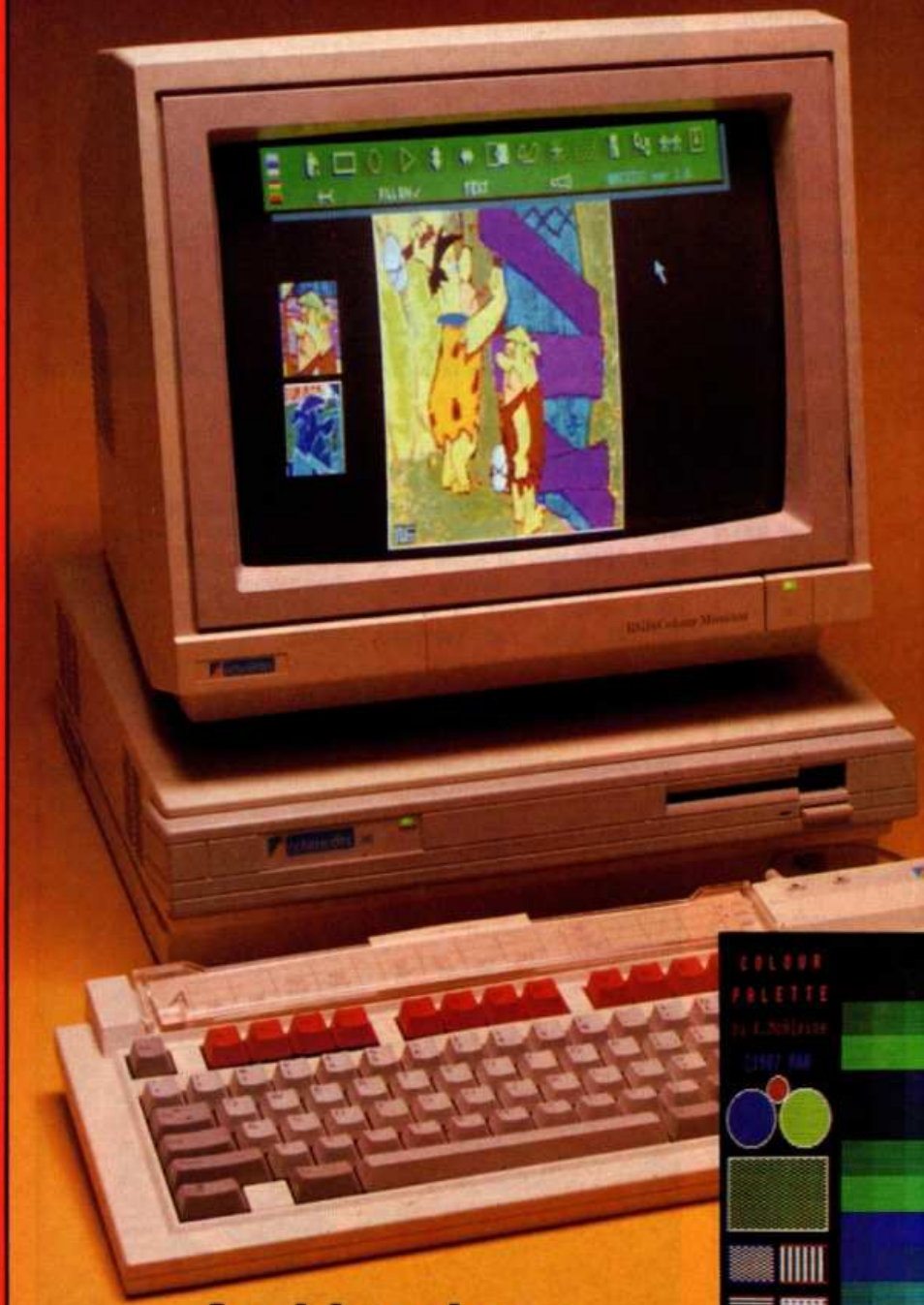


Archimedes Report

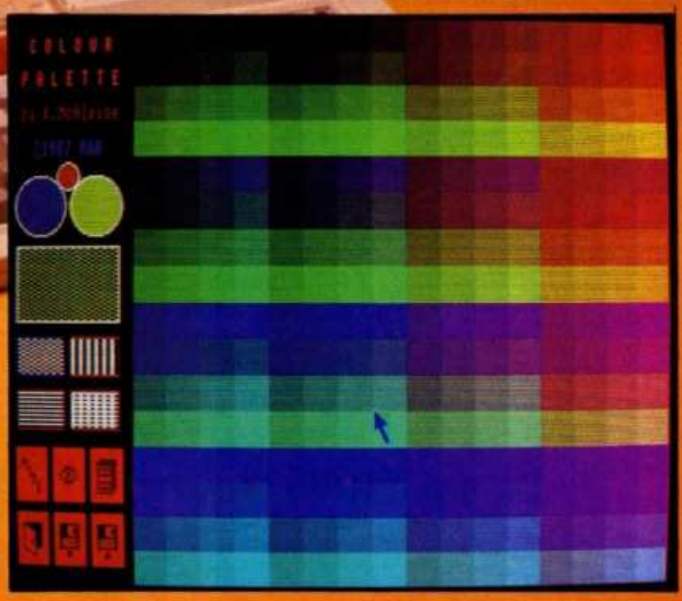
Gordon Taylor programs in **ISO Pascal**, moves his mouse around **System Delta Plus** and delves into the **Programmers Reference Manual.**

Red Keys

Your full news roundup from the world of Archimedes.

Palette Power

Conjure up your own colour combinations with this outstanding Archimedes utility.



Archimedes – the A in A&B Computing

RED KEYS

Solidisk produce Video Digitizer

I'm getting a terrible sense of *Deja Vu* when I came across this little ditty from Solidisk.

They have introduced not only one, but *two* video digitizers for the BBC Master series. Both have a composite video input (suitable for video camera, video recorder, their teletext adapter (see elsewhere in this news) or a TV set.

The usual outputs exist for computer and video, and the software has the basic functions: freeze, digitize, set colour palette, display digitized picture, save picture and so on, making it easy to write your own programs incorporating these features.

The results can include continuous display of digitized pictures, pictures saved to disc and the detection of movement. The controls include knobs to set sync level to suit various video sources and add aspect ratio, brightness and contrast – the are buttons to freeze and digitize printing.

There are two levels of digitizer as I mentioned earlier: The entry model is capable of displaying 16 shades of grey with a resolution of 640 (horizontal) by 300 (vertical) – but this is limited by the screen resolution as you can only display 256 lines on the Beeb anyway.

Pictures can be frozen and used with paint programs such as Artisan and ARM paint. The digitizer costs £60 inc VAT for the entry based model, whereas the advanced model is capable of 4096 shades of grey and is the same resolution as the entry model and is the one most broadcast studios and video pre-production companies will be interested in. The advanced model costs £180 including VAT.

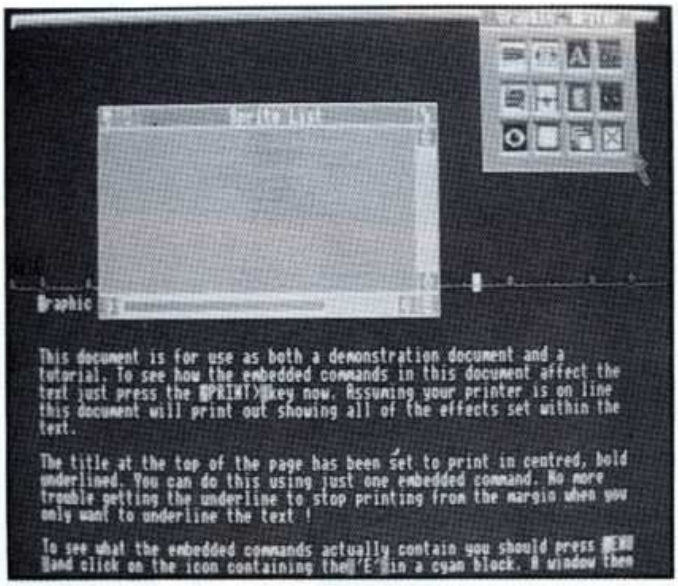
Contact Solidisk Technology at: 87 Bournemouth Park Road, Southend. ☎ (0702) 616 818.

PC Emulator News

Datathorn Systems, who are pioneering the use of the Epson laser printer with both BBC Micro and Archimedes, have reported interesting results from their experiments with the Archimedes PC emulation software. Vince Hagedorn told A&B that software running on the emulator included Borland Turbo BASIC and the Ventura Publisher desk top publishing software.

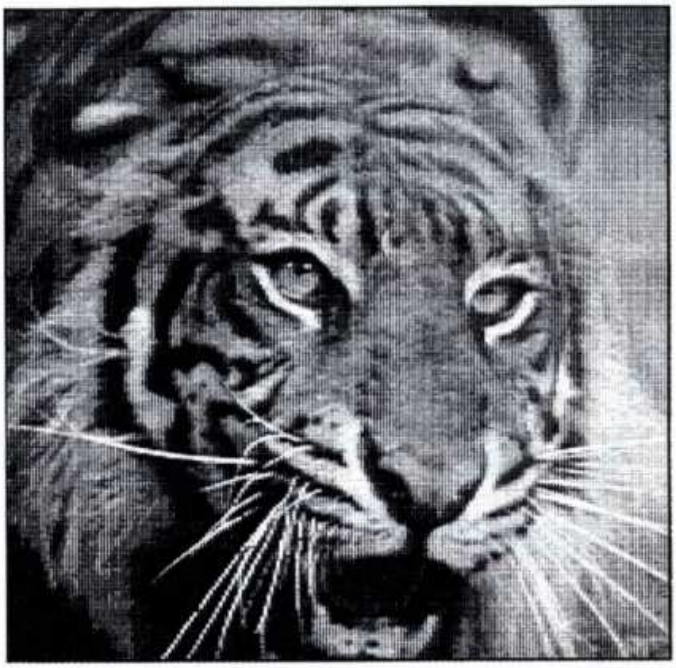
Although much useful PC software, including the Migent range of Ability, Account Ability and Page Ability (all available in 3½ inch format), will work on emulation, the software is not easy to use from double floppies. Software like Page Ability, with font sets some 650K in size!! need installing on a winchester disc. It might be sensible for Acorn to confine its 310M to a winchester based machine.

Further details about Epson laser and Archimedes on ☎ 01 508 4904.


This document is for use as both a demonstration document and a tutorial. To see how the embedded commands in this document affect the text just press the
key now. Assuming your printer is on line this document will print out showing all of the effects set within the text.
The title at the top of the page has been set to print in centred, bold underlined. You can do this using just one embedded command. No more trouble getting the underline to stop printing from the margin when you only want to underline the text !
To see what the embedded commands actually contain you should press
and click on the icon containing the 'E' in a cyan block. A window then

Clares do it again!

The impending release of Clares' latest offering – *Graphic Writer* is an alternative to Acorn's Arc Writer package . Giving users the excellent option of mixing multiple fonts and character sizes, it looks to be the first word processor set to compete with the new generation of WIMP driven packages for the Archie – a full review will appear next month.



Tiger tiger burning bright. At least it is when dumped out using ChromalocK for the Archimedes – a great looking image capture unit from Datathorn Systems. Look out in next month's Red Keys or ☎ 01 508 4904.

```
>L.
  10 REM >ZARCHZAPP
  20 REM BY NEIL WIPAT 24/12/87
  30 CODE=&7000
  40 CODE2=&7200
  50 FORT%=0 TO 3 STEP3
  60 P%=CODE
  70 [
  80 OPTT%
  90 STMFD R13!,{R0-R8} \ Save registers R0-R8 on stack
 100 ADR R0,lives       \  Load registers
 110 ADR R1,add         \  With addresses
 120 ADR R2,add1        \  Of data.
 130 ADR R3,add2        \
 140 ADR R4,leveladd    \
 150 ADR R5,level2      \
 160
 170 LDR R1,[R1,#0]     \  Load Registers
 180 LDR R2,[R2,#0]     \  With Data from
 190 LDR R3,[R3,#0]     \  the addresses
 200 LDR R4,[R4,#0]     \  specified above.
 210 LDR R5,[R5,#0]     \
 220 LDR R0,[R0,#0]     \
 230
 240 STR R0,[R1,#0]     \  Store Registers
 250 STR R0,[R2,#0]     \  At Specified
 260 STR R0,[R3,#0]     \  Addresses.
 270 STR R5,[R4,#0]     \
 280 LDMFD R13!,{R8-R0} \ Fetch registers R8-R0 from stack
 290 .end
 300 MOV PC,R14         \ Return
 310
 320 .lives EQUD &E2500000       \
 330 .add EQUD &0000B050         \
 340 .add1 EQUD &0000DE70        \
 350 .add2 EQUD &0000A1D4        \
 360 .leveladd EQUD &0000DC40    \
 370 .level2 EQUW &0000          \
 380 .level EQUW &E3A0           \
 390 ]
 400 NEXT
 410 P%=CODE2
 420 [
 430 MOV R0,#6          \ SET OSBYTE VECTOR
 440 ADR R1,CODE        \ TO POINT TO CODE
 450 MOV R2,#0          \ AT &7000
 460 SWI "OS_Claim"     \
 470 MOV PC,R14         \
 480]
 490 CLS
 500 INPUT"START LEVEL"!LEV
 510 ?(level2)=LEV-1
 520 PRINT"INSERT ZARCH DISK, AND PRESS A KEY"
 530 T$=GET$:IF T$="" THEN 530
 540 CALL CODE2
 550 *KEY1 *RUN !BOOT:M
 560 *FX138,0,129
```

Zarch cheat program!

Well it had to happen! We have a real humdinger of a program here, submitted by *Neil Wipatt* this is the first cheat program available for the Archimedes' first (and only?) mega-game.

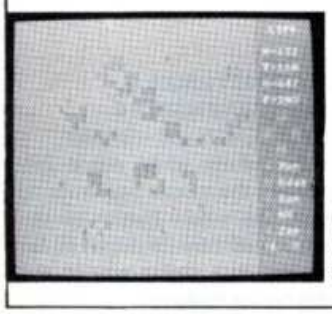
The program has been kludged so that it will crash the machine when the competition code flashes up – but as soon as the competition is over, we *may* publish the listing returning the secret codes – but then is it really worth it?

With this listing you can select the starting wave number, it will provide infinite smart bombs, lives *andan unlimited supply of* guided missiles!

Before running the program, you will have to se the Archie up properly, so type in: *CONFIG. screen. 20 <**Return**> **and then type** RUN .

The program works with the pre-release version of the Arthur operating system, and the new ROM operating system.

Have fun!



Coming soon to these pages, Archimedes Life – the classic simulation . . . Watch this space!

Yet more upgrades from Acorn!

Additional enhancements from Acorn have resulted in a veritable plethora of new items all available now (so we are told).

1 Megabyte RAM upgrades are currently available; consisting of 512K's worth of RAM chips, this is more or less "plug in and go", but the price of **£89** plus VAT includes fitting and testing by an approved Acorn dealer.

Second disc drives are already a sensible option, doubling your on line disc storage by 1.6 megabytes – it also makes disc copying much easier as does general everyday ADFS operation – the price of **£39** is a bit steep, but it requires a complete change of the grey plastic wedge at the front – again the price includes fitting and testing.

The Expansion Backplane is at last with us. The key upgrade for anyone wanting to install podules or expansion cards. This includes the necessary cooling fan and the **£39** price tag isn't too debilitating.

The I/O Podule is for BBC Model B hacks who have moved up, yet kept their existing hardware (Teletext adaptors etc). It won't turn your Archie into a Beeb, but it will give you an 8 bit Analogue to Digital converter, a user port (for Eprom programmers and the like), and, of course, the 1MHz bus.

The I/O podule also has an upgrade (for £29) giving you a MIDI interface for connecting similarly equipped electronic musical instruments.

The I/O podule costs **£79**.

Archimedes in Chroma

Wild Vision, the Newcastle based video specialists, have announced a genlock podule for the Archimedes. Called Chromalock, the genlock and full colour overlay system allows the graphics of the Archimedes to be superimposed onto a video picture.

The Chromalock can overlay captions, titles, even animations onto the the video picture during editing or in real time onto the signal from the camera.

Interactive video systems can use the Chromalock to display computer graphics over the pictures from a video disc player. A normal PAL composite video monitor can be used instead of the special monitors normally required in interactive systems.

Technically the Chromalock has a very stable genlock circuit with fast response time enabling it to lock on to any reasonably stable PAL/CCIR video signal, including domestic VCRs, and without noise problems. The Chromalock also encodes the computer's RGB output into a PAL signal, with wideband colour encoding.

Archimedes ROM upgrades here

The provisional disc based operating environment and machine settings are now a thing of the past now that Acorn have finally released their ROM upgrades.

The four ROMs hold the desktop environment, the window manager, all of the standard settings, as well as all of the desktop utilities are available from powering on the machine.

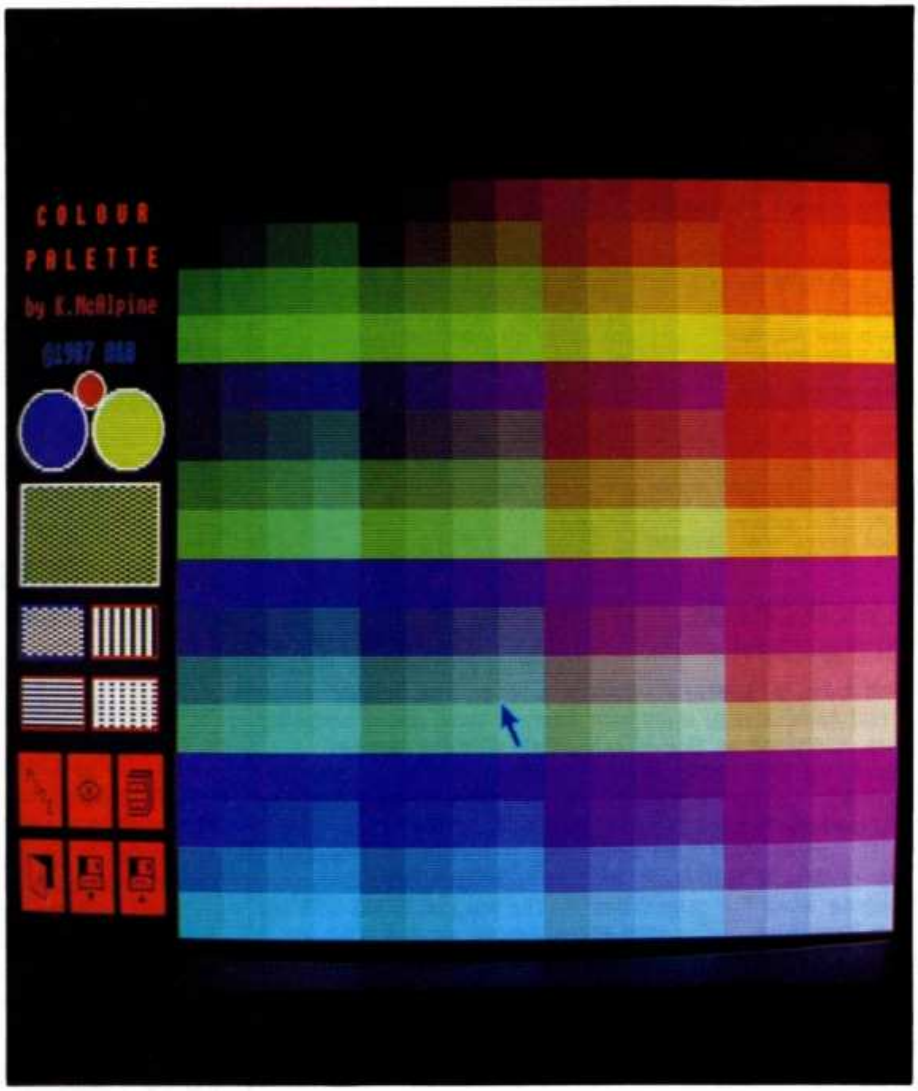
Turning on the Archie immediately drops you into the desktop (far faster that the Amiga or the ST), this upgrade also enables users to load and run Acorn's latest word processing package – *Arcwriter* sent separately.

If you are a registered user, then you will be eligible for the four ROMs and manual addenda.

Keith McAlpine

PALETTE POWER

Palette power with pixels!



This is a utility for manipulating all the colours on an Archimedes; it enables you to mix different hues of pixels to create new shades giving you well over 4096 variations. As the name of the program suggests, this is achieved by selecting two primary colours in the existing palette bank, combining them and displaying them using an on-screen palette.

All of this looks very impressive as it stands, but it really comes into its own by giving you the option to convert the colours you have created using the COLOUR or the VDU codes, with just a click of the mouse. These can then be used within the structure of your own programs.

The program is Mouse and Icon based, so the best way to explain how it works is to take you through a typical screen:

The small circle (on the top left of the screen) shows what colour you have selected from the choice of primary colours.The two larger circles to the right and the left of the small circle contain the foreground and background VDU characters – if you want to change one of the colours then all you need to do is point with the mouse and click the mouse button.

The large rectangle ays the outcome of your mix of colour.

The four smaller rectangles show the possible VDU attainable colours available for cross-hatching or dithering both background and foreground colours. The pattern selected appears highlighted, so selecting one of the other three permutations is done via the mouse.

The **Mode** icon is used for changing the number of colours and size of pixel available on-screen (● you can't select a two colour mode with a size 8 x 2 pixel as this would be equivalent to Mode 5).

The **Display** icon displays the colours you have selected and saved, there is an option to print them out. Move over the arrow and press any mouse button to move between screens, the last screen will contain that the current mode is set up for.

The **STORE** icon stores a defined colour in memory; if the colour already exists then it will not be stored again.

The **EXIT** icon, **LOAD** icon and the **SAVE** icon are all fairly self explanatory.

To run the program first type (or have set up in a !BOOT file)-

***CONFIGURE SPRITESIZE 6**
***CONFIGURE SCREENSIZE 0**

and then press <Ctrl> and <Break>.

To change the palette whilst not in 256 colour mode, select the colour you want to change and press the middle button on the mouse. Three bars will then be displayed for changing the colour in a similar way to the palette program on the desktop.

```
LIST
   10REM >ColourPal
   20REM A program for ditheri
ng different colours in differ
ent modes
   30REM by Keith McAlpine
   40
   50ON ERROR MODE0:REPORT:PRI
NT;" @ line ";ERL:END
   60PROCset_system
   70PROCwhat_mode
   80PROCdraw_default_colours
   90PROCdraw_screen
  100REPEAT:REPEAT
  110MOUSE x%,y%,z%
  120UNTIL z%<>0
  130
  140CASE TRUE OF
  150WHEN (x%>=254 AND z%=2):P
ROCnew_colour
  160WHEN x%>=254:PROCget_colo
ur
  170WHEN (x%>=8 AND x%<=116)
AND (y%>=628 AND y%<=736):PROC
colour(62,0)
  180WHEN (x%>=124 AND x%<=232
) AND (y%>=628 AND y%<=736):PR
OCcolour(178,1)
  190WHEN (x%>=14 AND x%<=112)
 AND (y%>=382 AND y%<=448):PRO
Cselect_box(14,382,224):char%=
224
  200WHEN (x%>=126 AND x%<=224
) AND (y%>=382 AND y%<=448):PR
OCselect_box(126,382,225):char
%=225
  210WHEN (x%>=14 AND x%<=112)
 AND (y%>=286 AND y%<=350):PRO
Cselect_box(14,286,226):char%=
226
  220WHEN (x%>=126 AND x%<=224
) AND (y%>=286 AND y%<=350):PR
OCselect_box(126,286,227):char
%=227
  230WHEN (x%>=89 AND x%<=153)
 AND (y%>=28 AND y%<=123):PROC
load
  240WHEN (x%>=10 AND x%<=74)
AND (y%>=28 AND y%<=123):PROCe
xit
  250WHEN (x%>=166 AND x%<=230
) AND (y%>=28 AND y%<=123):PRO
Csave
  260WHEN (x%>=10 AND x%<=74)
AND (y%>=151 AND y%<=246):PROC
mode
  270WHEN (x%>=89 AND x%<=153)
 AND (y%>=151 AND y%<=246):PRO
Cdisplay
  280WHEN (x%>=166 AND x%<=230
) AND (y%>=151 AND y%<=246):PR
OCstore
  290ENDCASE
  300K=INKEY(20):UNTIL finishe
d%
  310MODE0:END
  320
  330DEFPROCdraw_default_colou
rs
  340CASE no_cols% OF
  350WHEN 4:PROC4cols
  360WHEN 2:PROC2cols
  370WHEN 16:PROC16cols
  380OTHERWISE PROC256cols
  390ENDCASE
  400ENDPROC
  410
  420DEFPROCbox(RETURN X%,RETU
RN Y%,size%)
  430RECTANGLE FILL X%,Y%-size
%,size%,size%
  440X%=X%+size%:IF X%>=1279 X
%=255:Y%=Y%-size%
  450ENDPROC
  460
  470DEFPROC256cols
  480X%=255:Y%=1023
  490FOR colour%=0 TO 63
  500FOR tint%=0 TO 192 STEP 6
4
  510GCOL colour% TINT tint%
  520PROCbox(X%,Y%,64):NEXT,
  530ENDPROC
  540
  550DEFPROC16cols
  560PROCget_default(2)
  570X%=255:Y%=1023
  580FOR colour%=0 TO 15
  590GCOL colour%
  600PROCbox(X%,Y%,256):NEXT
  610ENDPROC
  620
  630DEFPROC4cols
  640PROCget_default(1)
  650X%=255:Y%=1023:RESTORE 41
30
  660FOR LP%=0 TO 3
  670READ data%:GCOL data%
  680PROCbox(X%,Y%,512):NEXT
  690ENDPROC
  700
  710DEFPROC2cols
  720PROCget_default(0)
  730GCOL0:RECTANGLE FILL 255,
512,1024,512
  740GCOL7:RECTANGLE FILL 255,
0,1024,512
  750ENDPROC
  760
  770DEFPROCdraw_screen
  780COLOUR 128 TINT 192
  790VDU28,0,31,14,0,12,26
  800COLOUR7
  810PRINTTAB(2,1)"C O L O U R
"TAB(1,3)"P A L E T T E"
  820COLOUR2:PRINTTAB(1,5)"by
K.McAlpine"
  830COLOUR36:PRINTTAB(3,7)CHR
$169;"1988 A&B"
  840IF mode%=12 THEN GCOL7 EL
SE GCOL63
  850CIRCLE FILL 120,732,24
  860CIRCLE FILL 62,682,54:CIR
CLE FILL 178,682,54
  870RECTANGLE FILL 12,478,214
,132:GCOL 0 TINT 0
  880CIRCLE FILL 62,682,50:CIR
CLE FILL 178,682,50
  890CIRCLE FILL 120,732,20
  900gcol%()=0:gtint%()=0
  910PROCchar_type
  920VDU23,228,0,126,66,66,66,
66,126,0
  930VDU23,229,0,126,126,126,1
26,126,126,0
  940VDU23,230,8,20,32,119,20,
20,28,0
  950VDU23,231,28,20,20,119,32
,20,8,0
  960VDU23,232,63,35,32,32,32,
32,32,32
  970VDU23,233,255,255,127,15,
1,1,1,17
  980VDU23,234,252,252,252,252
,252,252,252,252
  990VDU23,235,32,32,32,32,28,
3,0,0
 1000VDU23,236,41,33,17,1,1,12
9,97,15
 1010VDU23,237,252,252,252,252
,0,0,0,0
 1020VDU23,238,63,63,63,63,63,
63,63,56
 1030VDU23,239,255,192,192,192
,192,192,255,0
 1040VDU23,240,252,12,236,236,
236,12,252,28
 1050VDU23,241,49,52,48,63,16,
0,0,0
 1060VDU23,242,76,137,0,255,0,
126,60,24
 1070VDU23,243,140,76,12,252,8
,0,0,0
 1080VDU23,244,76,137,0,255,0,
24,60,126
 1090VDU23,245,34,54,42,34,34,
0,0,0
 1100VDU23,246,0,0,0,0,96,144,
144,151
 1110VDU23,247,100,4,4,7,0,0,0
,0
 1120VDU23,248,128,128,128,60,
32,56,32,60
 1130VDU23,249,7,26,63,32,47,4
0,40,47
 1140VDU23,250,255,170,255,0,2
55,1,97,255
 1150VDU23,251,252,188,212,108
,84,108,84,108
 1160VDU23,252,32,32,47,40,40,
47,32,63
 1170VDU23,253,0,0,255,1,97,25
5,0,255
 1180VDU23,254,84,108,84,108,8
4,108,112,192
 1190VDU23,128,0,0,0,2,1,19,12
,48
 1200VDU23,129,0,0,36,36,126,1
29,60,102
 1210VDU23,130,0,0,0,64,128,20
0,48,12
 1220VDU23,131,12,19,1,2,0,0,0
,0
 1230VDU23,132,60,129,126,36,3
6,0,0,0
 1240VDU23,133,48,200,128,64,0
,0,0,0
 1250PROCselect_box(14,382,224
):char%=224
 1260GCOL 3:RECTANGLE FILL 10,
155,64,96
 1270RECTANGLE FILL 89,155,64,
96
 1280RECTANGLE FILL 166,155,64
,96
 1290RECTANGLE FILL 166,32,64,
96
 1300RECTANGLE FILL 89,32,64,9
6
 1310RECTANGLE FILL 10,32,64,9
6
 1320GCOL0:VDU5
 1330MOVE18,110:VDU232,233,234
,10,8,8,8,235,236,237
 1340MOVE97,110:VDU238,239,240
,10,8,8,8,241,242,243
 1350MOVE174,110:VDU238,239,24
0,10,8,8,8,241,244,243
 1360MOVE18,230:VDU245,246,10,
8,247,248
 1370MOVE174,230:VDU249,250,25
1,10,8,8,8,252,253,254
 1380MOVE97,230:VDU128,129,130
,10,8,8,8,131,132,133
 1390VDU4:ENDPROC
 1400
 1410DEFPROCvdu(char%,x%,y%)
```

```
 1420COLOUR128
 1430IF mode%=15 THEN COLOUR 6
3 ELSE COLOUR7
 1440VDU31,x%,y%,char%,char%,c
har%,char%,char%,char%
 1450VDU31,x%,y%+1,char%,char%
,char%,char%,char%,char%
 1460ENDPROC
 1470
 1480DEFPROCset_system
 1490DIM gcol%(1),gtint%(1),st
orel%(1000),storer%(1000),stor
ev%(1000),storep%(1000),storen
c%(1000),red%(2,15),green%(2,1
5),blue%(2,15),font 8
 1500FOR lp%=0 TO 15
 1510READ data%,data2%,data3%
 1520FOR lp2%=0 TO 2
 1530red%(lp2%,lp%)=data%
 1540green%(lp2%,lp%)=data2%
 1550blue%(lp2%,lp%)=data3%
 1560NEXT,
 1570DATA 0,0,0,255,0,0,0,255,
0,255,255,0,0,0,255,255,0,255,
0,255,255,255,255,255
 1580DATA 0,0,0,128,0,0,0,128,
0,128,128,0,0,0,128,128,0,128,
0,128,128,128,128,128
 1590store%=0:finished%=0:gcol
%()=0
 1600gtint%()=0:gcol%=0:gtint%
=0:vdu%=0
 1610MOUSE RECTANGLE 0,0,1279,
1023
 1620MOUSE TO 640,512:MOUSE ST
EP 1,1
 1630OSCLI("SNEW"):OSCLI("POIN
TER 1")
 1640no_cols%=256:pixel%=4:MOU
SE ON
 1650ENDPROC
 1660
 1670DEFPROCwhat_mode
 1680IF no_cols%=256 THEN mode
%=15 ELSE mode%=12
 1690MODE mode%:VDU23;8202;0;0
;0;:*POINTER 1
 1700ENDPROC
 1710
 1720DEFPROCget_colour
 1730gcol%=POINT(x%,y%):gtint%
=TINT(x%,y%)
 1740GCOL gcol% TINT gtint%
 1750CIRCLE FILL 120,732,20
 1760ENDPROC
 1770
 1780DEFPROCcolour(X%,n%)
 1790gcol%(n%)=gcol%:gtint%(n%
)=gtint%
 1800GCOL gcol% TINT gtint%
 1810CIRCLE FILL X%,682,50:PRO
Crectangle
 1820ENDPROC
 1830
 1840DEFPROCrectangle
 1850COLOUR (128+gcol%(0)) TIN
T gtint%(0)
 1860COLOUR gcol%(1) TINT gtin
t%(1)
 1870PRINTTAB(1,16);STRING$(13
,CHR$(vdu%));TAB(1,15);STRING$
(13,CHR$(vdu%));
 1880PRINTTAB(1,14);STRING$(13
,CHR$(vdu%));TAB(1,13);STRING$
(13,CHR$(vdu%))
 1890ENDPROC
 1900
 1910DEFPROCselect_box(X%,Y%,v
%)
 1920GCOL3:RECTANGLE 14,382,98
,66
 1930RECTANGLE 126,382,98,66
 1940RECTANGLE 14,286,98,66
 1950RECTANGLE 126,286,98,66
 1960IF mode%=15 THEN GCOL 32
TINT 255 ELSE GCOL4
 1970RECTANGLE X%,Y%,98,66:vdu
%=v%
 1980PROCrectangle
 1990ENDPROC
 2000
 2010DEFPROCdisplay
 2020PROCmake_window(15,29,35,
22,0,135)
 2030PRINTTAB(19,23)"Do you wa
nt a"TAB(21,25)"printout?"
 2040ans%=FNyes_no
 2050PROCdelete_window(15,29)
 2060mo%=no_cols%
 2070PROCmake_window(20,29,43,
3,7,128)
 2080IF ans% THEN PROCprintout
:ENDPROC
 2090COLOUR135:COLOUR0
 2100PRINTTAB(20,3);STRING$(24
,CHR$230);TAB(20,25);STRING$(2
4,CHR$231)
 2110COLOUR128:COLOUR7
 2120IF no_cols%=256 THEN PROC
double("QUIT",30,27) ELSE PROC
double("QUIT    16    4    2",
22,27)
 2130end%=store%-1:lp%=0:start
%=0:done%=0
 2140PROCprint_info(start%,end
%,lp%,mo%)
 2150REPEAT:REPEAT
 2160MOUSE x%,y%,button%
 2170UNTIL button%<>0
 2180PROCget_text_coords(x%,y%
)
 2190IF y%=25 PROCprint_info(s
tart%,end%,lp%,mo%)
 2200IF y%=3 AND start%>=5 THE
N
 2210start%-=10:IF start%<0 st
art%=0
 2220PROCprint_info(start%,end
%,lp%,mo%)
 2230ENDIF
 2240m%=mo%
 2250IF no_cols%=256 THEN
 2260IF FNmouse_area(30,28,4,2
) THEN done%=-1
 2270ELSE
 2280IF FNmouse_area(22,28,4,2
) THEN done%=-1
 2290IF FNmouse_area(30,28,2,2
) THEN mo%=16
 2300IF FNmouse_area(36,28,1,2
) THEN mo%=4
 2310IF FNmouse_area(41,28,1,2
) THEN mo%=2
 2320ENDIF
 2330IF m%<>mo% THEN VDU7:star
t%=0:PROCprint_info(start%,end
%,lp%,mo%)
 2340K=INKEY(20)
 2350UNTIL done%
 2360PROCdelete_window(20,29)
 2370ENDPROC
 2380
 2390DEFPROCstore
 2400IF store%>=1000 THEN ENDP
ROC
 2410storep%(store%)=pixel%:st
orenc%(store%)=no_cols%
 2420storev%(store%)=char%
 2430storel%(store%)=POINT(62,
682)+TINT(62,682)
 2440storer%(store%)=POINT(178
,682)+TINT(178,682)
 2450IF store%=0 THEN 2520
 2460done%=0:lp%=0
 2470REPEAT
 2480IF storep%(store%)=storep
%(lp%) AND storenc%(store%)=st
orenc%(lp%) AND storev%(store%
)=storev%(lp%) AND storel%(sto
re%)=storel%(lp%) AND storer%(
store%)=storer%(lp%) THEN done
%=-1
 2490lp%+=1
 2500UNTIL done% OR store%=lp%
 2510IF done% THEN 2530
 2520store%+=1
 2530VDU7
 2540ENDPROC
 2550
 2560DEFPROCload
 2570LOCAL ERROR
 2580ON ERROR LOCAL:VDU7:GOTO2
820
 2590CLOSE#0
 2600PROCmake_window(25,25,45,
21,0,135)
 2610PRINTTAB(28,22)"Loading P
alette"
 2620VDU31,26,24,62,31,44,24,6
0,31,27,24
 2630file$=FNenter(33,127,17)
 2640IF file$="" THEN VDU7:GOT
O2830
 2650file=OPENIN(file$):IF fil
e=0 THEN VDU7:GOTO2820
 2660FOR lp%=0 TO 2
 2670FOR lp2%=0 TO 15
 2680red%(lp%,lp2%)=BGET#file
 2690green%(lp%,lp2%)=BGET#fil
e
 2700blue%(lp%,lp2%)=BGET#file
 2710NEXT,
 2720store%=BGET#file
 2730IF store%=0 THEN 2820
 2740FOR lp%=0 TO (store%-1)
 2750storel%(lp%)=BGET#file
 2760storer%(lp%)=BGET#file
 2770storev%(lp%)=BGET#file
 2780storep%(lp%)=BGET#file
 2790storenc%(lp%)=BGET#file
 2800IF storenc%(lp%)=0 THEN s
torenc%(lp%)=256
 2810NEXT
 2820CLOSE#file
 2821PROCdraw_default_colours
 2830PROCdelete_window(25,25)
 2840RESTORE ERROR
 2850ENDPROC
 2860
 2870DEFPROCsave
 2880LOCAL ERROR
 2890ON ERROR LOCAL VDU7:CLOSE
#0:GOTO3130
 2900CLOSE#0
 2910PROCmake_window(25,25,45,
21,0,135)
 2920PRINTTAB(28,22)"Saving  P
alette"
 2930VDU31,26,24,62,31,44,24,6
0,31,27,24
 2940file$=FNenter(33,127,17)
 2950IF file$="" THEN VDU7:GOT
O3130
 2960file=OPENOUT(file$)
 2970FOR lp%=0 TO 2
 2980FOR lp2%=0 TO 15
 2990BPUT#file,red%(lp%,lp2%)
```

```
 3000BPUT#file,green%(lp%,lp2%
)
 3010BPUT#file,blue%(lp%,lp2%)
 3020NEXT,
 3030BPUT#file,store%
 3040IF store%=0 THEN3120
 3050FOR lp%=0 TO store%-1
 3060BPUT#file,storel%(lp%)
 3070BPUT#file,storer%(lp%)
 3080BPUT#file,storev%(lp%)
 3090BPUT#file,storep%(lp%)
 3100BPUT#file,storenc%(lp%)
 3110NEXT lp%
 3120CLOSE#file
 3130PROCdelete_window(25,25)
 3140RESTORE ERROR
 3150ENDPROC
 3160
 3170DEFPROCexit
 3180PROCmake_window(15,29,35,
22,0,135)
 3190PRINTTAB(19,23)"Are you
sure"TAB(17,25)"you want to qu
it?"
 3200ans%=FNyes_no
 3210PROCdelete_window(15,29)
 3220IF ans% THEN finished%=-1
 3230ENDPROC
 3240
 3250DEFPROCmode
 3260PROCmake_window(15,29,45,
15,0,135)
 3270PRINTTAB(18,16)"Colour an
d Size Selection"
 3280PRINTTAB(18,19)"Num. of"T
AB(18,20)"colours"
 3290PRINTTAB(18,23)"Size of"T
AB(19,24)"pixel"
 3300PROCdouble("256   16   4
  2",27,19)
 3310PROCdouble("2x4   4x4   8
x4",28,23)
 3320PROCdouble("OK
  QUIT",21,27)
 3330a%=0:b%=0:nc%=no_cols%:pi
%=pixel%
 3340flag%=0:PROCoption_menu:o
ut%=0
 3350REPEAT:REPEAT
 3360MOUSE x%,y%,button%
 3370UNTIL button%<>0
 3380PROCget_text_coords(x%,y%
)
 3390CASE y% OF
 3400WHEN 19,20:
 3410PROCwipe_pointer
 3420CASE x% OF
 3430WHEN 41,42,43:b%=40:nc%=2
:IF pi%=4 THEN VDU7:nc%=4:b%=3
6
 3440WHEN 37,38,49:b%=36:nc%=4
 3450WHEN 32,33,34:b%=31:nc%=1
6
 3460WHEN 27,28,29:b%=26:nc%=2
56
 3470ENDCASE
 3480PROCoption_menu
 3490WHEN 23,24:
 3500PROCwipe_pointer
 3510CASE x% OF
 3520WHEN 28,29,30:a%=27:pi%=1
 3530WHEN 34,35,36:a%=33:pi%=2
 3540WHEN 40,41,42:a%=39:pi%=4
 3550ENDCASE
 3560PROCoption_menu
 3570WHEN 27,28:
 3580IF x%=21 OR x%=22 THEN
 3590out%=-1:IF nc%<>no_cols%
THEN flag%=TRUE
 3600no_cols%=nc%:pixel%=pi%
 3610ENDIF
 3620IF x%>35 AND x%<40 THEN o
ut%=-1
 3630ENDCASE
 3640UNTIL out%
 3650PROCdelete_window(15,29)
 3660IF flag% THEN PROCwhat_mo
de:PROCdraw_default_colours:PR
OCdraw_screen
 3670PROCchar_type
 3680ENDPROC
 3690
 3700DEFPROCmake_window(lx%,by
%,rx%,ty%,fc%,bc%)
 3710MOUSE RECTANGLE (lx%*16),
1023-(by%*32),(rx%-lx%)*16,(by
%-ty%)*32
 3720MOVE (lx%*16),991-(by%*32
):MOVE (rx%*16)+16,1023-(ty%*3
2)
 3730*SGET temp
 3740COLOUR bc%:COLOUR fc%
 3750VDU4,28,lx%,by%,rx%,ty%,1
2,26
 3760ENDPROC
 3770
 3780DEFPROCdelete_window(lx%,
by%)
 3790*SCHOOSE temp
 3800PLOT&ED,(lx%*16),991-(by%
*32)
 3810MOUSE RECTANGLE 0,0,1279,
1023
 3820ENDPROC
 3830
 3840DEFPROCoption_menu
 3850IF a%>0 OR b%>0 THEN 3970
 3860CASE pixel% OF
 3870WHEN 1:a%=27
 3880WHEN 2:a%=33
 3890WHEN 4:a%=39
 3900ENDCASE
 3910CASE no_cols% OF
 3920WHEN 2:b%=40
 3930WHEN 4:b%=36
 3940WHEN 16:b%=31
 3950WHEN 256:b%=26
 3960ENDCASE
 3970PROCdouble(CHR$187,b%,19)
 3980PROCdouble(CHR$171,b%+4,1
9)
 3990PROCdouble(CHR$187,a%,23)
 4000PROCdouble(CHR$171,a%+4,2
3)
 4010ENDPROC
 4020
 4030DEFPROCwipe_pointer
 4040VDU31,b%,19,32,10,8,32,31
,b%+4,19,32,10,8,32
 4050VDU31,a%,23,32,10,8,32,31
,a%+4,23,32,10,8,32
 4060ENDPROC
 4070
 4080DEFPROCget_text_coords(RE
TURN x%,RETURN y%)
 4090x%=x%/16:y%=(1023-y%)/32
 4100ENDPROC
 4110
 4120REM **** 4 COLOUR MODE DA
TA
 4130DATA 0,1,3,7
 4140REM **** 16 COLOUR MODE D
ATA
 4150DATA 0,1,2,3,4,5,6,7,8,9,
10,11,12,13,14,15
 4160REM **** 2 COLOUR MODE DA
TA
 4170DATA 0,7
 4180
 4190DEFPROCdouble(text$,A%,B%
)
 4200VDU4,31,A%,B%
 4210FOR LP%=1 TO LEN(text$)
 4220?font=ASC(MID$(text$,LP%)
)
 4230SYS "OS_Word",10,font,fon
t DIV&100
 4240VDU23,254,font?1,font?1,f
ont?2,font?2,font?3,font?3,fon
t?4,font?4
 4250VDU23,255,font?5,font?5,f
ont?6,font?6,font?7,font?7,fon
t?8,font?8
 4260VDU254,10,8,255,11:NEXT
 4270ENDPROC
 4280
 4290DEFFNyes_no
 4300PROCdouble("YES
NO",18,27)
 4310REPEAT:REPEAT
 4320MOUSE x%,y%,button%
 4330UNTIL button%<>0
 4340PROCget_text_coords(x%,y%
)
 4350CASE x% OF
 4360WHEN 18,19,20:IF y%=27 OR
 y%=28 THEN =-1
 4370WHEN 31,32:IF y%=27 OR y%
=28 THEN =0
 4380ENDCASE
 4390UNTIL 0
 4400
 4410DEFPROCnew_colour
 4420IF no_cols%=256 THEN VDU7
:ENDPROC
 4430col%=POINT(120,732)
 4440PROCmake_window(15,29,35,
19,0,135)
 4450PRINTTAB(16,20)"Are  you
 sure  you"TAB(16,21)"want to
 change the"
 4460PRINTTAB(17,22)"colour pa
lette as"TAB(16,23)"it could a
ffect any"
 4470PRINTTAB(17,24)"currently
  STORED"TAB(22,25)"colours"
 4480ans%=FNyes_no
 4490PROCdelete_window(15,29)
 4500IF NOT ans% THEN ENDPROC
 4510PROCmake_window(0,29,22,2
0,0,135)
 4520PRINTTAB(3,21)"RED"TAB(1,
23)"GREEN"TAB(2,25)"BLUE"
 4530PROCdouble("OK",10,27):do
ne%=0
 4540CASE no_cols% OF
 4550WHEN 2:mo%=0
 4560WHEN 4:mo%=1
 4570WHEN 16:mo%=2
 4580ENDCASE
 4590PRINTTAB(7,21);STRING$(re
d%(mo%,col%)/16,CHR$229);STRIN
G$(15-(red%(mo%,col%)/16),CHR$
228)
 4600PRINTTAB(7,23);STRING$(gr
een%(mo%,col%)/16,CHR$229);STR
ING$(15-(green%(mo%,col%)/16),
CHR$228)
 4610PRINTTAB(7,25);STRING$(bl
ue%(mo%,col%)/16,CHR$229);STRI
NG$(15-(blue%(mo%,col%)/16),CH
R$228)
 4620REPEAT:REPEAT
 4630MOUSE x%,y%,button%
 4640UNTIL button%<>0
 4650PROCget_text_coords(x%,y%
)
```

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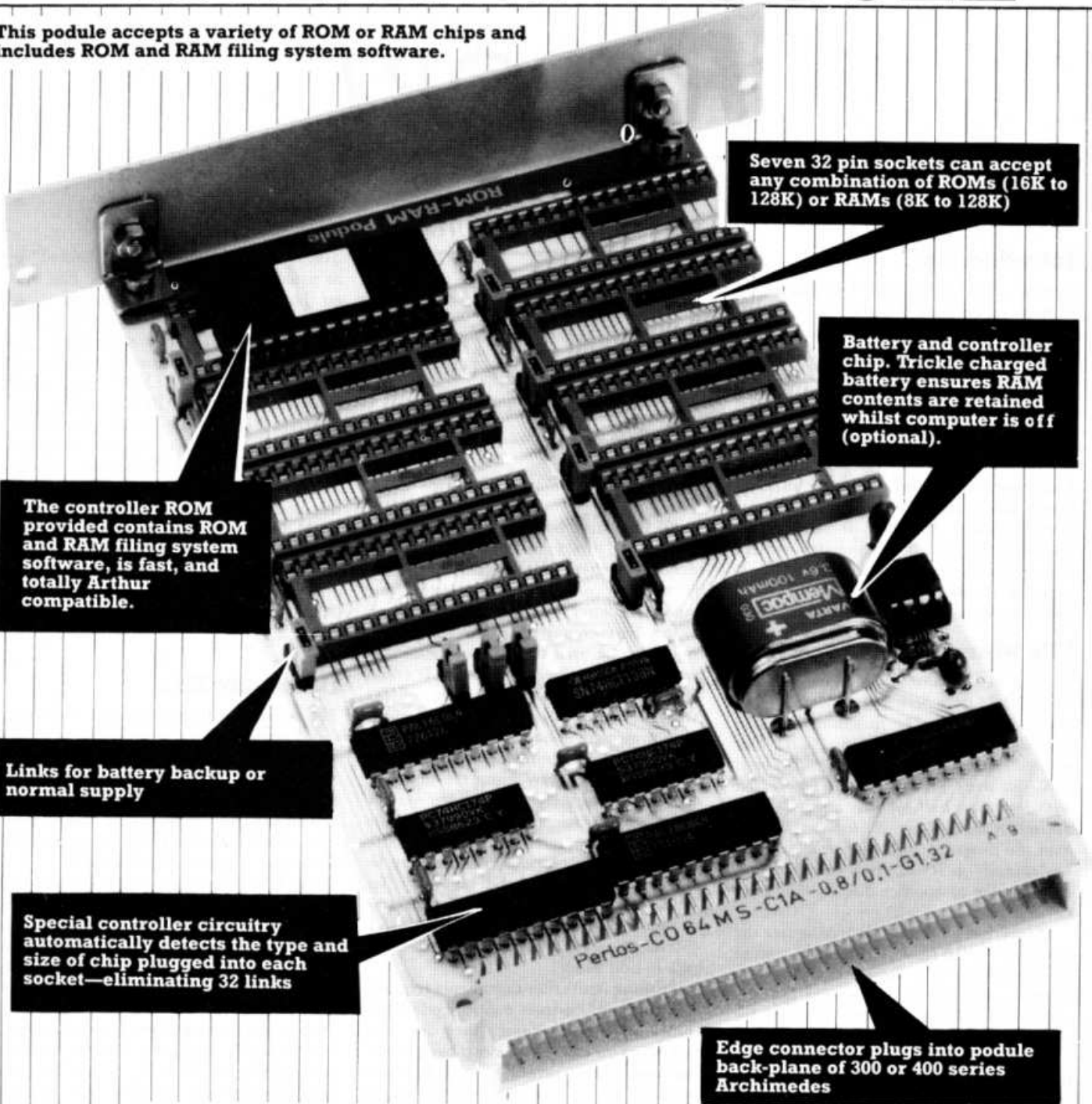
```
 4660IF x%<6 OR x%>21 THEN 472
0
 4670IF y%=21 THEN PROCline(x%
,y%,red%(mo%,col%))
 4680IF y%=23 THEN PROCline(x%
,y%,green%(mo%,col%))
 4690IF y%=25 THEN PROCline(x%
,y%,blue%(mo%,col%))
 4700IF (x%=10 OR x%=11) AND (
y%=27 OR y%=28) THEN done%=-1
 4710COLOUR col%,red%(mo%,col%
),green%(mo%,col%),blue%(mo%,c
ol%)
 4720UNTIL done%
 4730PROCdelete_window(0,29)
 4740ENDPROC
 4750
 4760DEFPROCline(x%,y%,RETURN
co%)
 4770len%=x%-6:co%=len%*16
 4780PRINTTAB(7,y%);STRING$(le
n%,CHR$229);STRING$(15-len%,CH
R$228)
 4790ENDPROC
 4800
 4810DEFPROCget_default(mode_n
o%)
 4820FOR lp%=0 TO 15
 4830COLOUR lp%,red%(mode_no%,
lp%),green%(mode_no%,lp%),blue
%(mode_no%,lp%)
 4840NEXT
 4850ENDPROC
 4860
 4870DEFFNmode(pix%,cols%)
 4880ON pix% GOTO 4890,4930,10
,4970
 4890IF cols%=2 THEN =0
 4900IF cols%=4 THEN =8
 4910IF cols%=16 THEN =12
 4920IF cols%=256 THEN =15
 4930IF cols%=2 THEN =4
 4940IF cols%=4 THEN =1
 4950IF cols%=16 THEN =9
 4960IF cols%=256 THEN =13
 4970IF cols%=4 THEN =5
 4980IF cols%=16 THEN =2
 4990IF cols%=256 THEN =10
 5000
 5010DEFPROCchar_type
 5020IF pixel%=1 RESTORE 5150
 5030IF pixel%=2 RESTORE 5190
 5040IF pixel%=4 RESTORE 5230
 5050FOR vdu%=224 TO 227
 5060VDU 23,vdu%
 5070FOR lp%=1 TO 8
 5080READ data%:VDU data%
 5090NEXT,
 5100PROCvdu(224,1,18):PROCvdu
(225,8,18)
 5110PROCvdu(226,1,21):PROCvdu
(227,8,21)
 5120vdu%=char%:PROCrectangle
 5130ENDPROC
 5140
 5150DATA 170,85,170,85,170,85
,170,85
 5160DATA 170,170,170,170,170,
170,170,170
 5170DATA 255,0,255,0,255,0,25
5,0
 5180DATA 255,170,255,170,255,
170,255,170
 5190DATA 204,51,204,51,204,51
,204,51
 5200DATA 204,204,204,204,204,
204,204,204
 5210DATA 255,0,255,0,255,0,25
5,0
 5220DATA 255,204,255,204,255,
204,255,204
 5230DATA 240,15,240,15,240,15
,240,15
 5240DATA 240,240,240,240,240,
240,240,240
 5250DATA 255,0,255,0,255,0,25
5,0
 5260DATA 255,240,255,240,255,
240,255,240
 5270
 5280DEFPROCprint_info(RETURN
start%,RETURN end%,lp%,mo%)
 5290dummy%=0
 5300VDU28,20,24,43,4:COLOUR12
8:CLS:VDU26
 5310IF start%>end% THEN PROCm
sg_pal:GOTO5440
 5320WHILE (start%<=end%) AND
(lp%<20)
 5330COLOUR (storel%(start%) M
OD64)+128
 5340COLOUR storer%(start%) MO
D64
 5350IF storenc%(start%)<>mo%
THEN 5420
 5360VDU31,21,lp%+5,storev%(st
art%),storev%(start%),10,8,8,s
torev%(start%),storev%(start%)
,10,8,8,storev%(start%),storev
%(start%)
 5370COLOUR128:COLOUR7
 5380PRINTTAB(24,lp%+5);"MODE
";FNmode(storep%(start%),store
nc%(start%));" : VDU ";storev%
(start%)
 5390PRINTTAB(24,lp%+6);"COLOU
R ";(storel%(start%) MOD64)+12
8;" TINT ";storel%(start%)-(st
orel%(start%) MOD64)
 5400PRINTTAB(24,lp%+7);"COLOU
R ";storer%(start%) MOD64;" TI
NT ";storer%(start%)-(storer%(
start%) MOD64)
 5410lp%+=4
 5420start%+=1
 5430ENDWHILE
 5440WHILE (start% MOD5)<>0
 5450start%+=1
 5460ENDWHILE
 5470ENDPROC
 5480
 5490DEFFNmouse_area(lx%,by%,w
idth%,height%)
 5500IF (x%>=lx% AND x%<=(lx%+
width%-1)) AND (y%<=by% AND y%
>=(by%-height%+1)) THEN =-1
 5510=0
 5520
 5530DEFPROCmsg_pal
 5540COLOUR128:COLOUR7:start%+
=5
 5550IF mo%=256 THEN PRINTTAB(
22,6)"You cannot  redefine"TAB
(24,8)"the palette in a"TAB(24
,10)"256 colour mode.":ENDPROC
 5560IF mo%=16 type%=2:RESTORE
4150
 5570IF mo%=4 type%=1:RESTORE4
130
 5580IF mo%=2 type%=0:RESTORE
4170
 5590IF NOT dummy% THEN PRINTT
AB(25,5)"The palette is"TAB(22
,6)"currently defined as"
 5600FOR lp%=0 TO mo%-1
 5610READ d%
 5620PRINTTAB(22,lp%+8);"COLOU
R ";lp%;",";red%(type%,d%);","
;green%(type%,d%);",";blue%(ty
pe%,d%)
 5630NEXT lp%
 5640ENDPROC
 5650
 5660DEFFNenter(min%,max%,len%
)
 5670word$=""
 5680REPEAT:REPEAT:K=GET
 5690UNTIL (K>=min% AND K<=max
%) OR K=13
 5700IF K=13 THEN 5760
 5710IF K=127 AND LEN(word$)>0
 THEN word$=LEFT$(word$):GOTO5
750
 5720IF K=127 THEN 5760
 5730IF LEN(word$)>=len% THEN
5760
 5740word$=word$+CHR$(K)
 5750VDU K
 5760UNTIL K=13
 5770=word$
 5780
 5790DEFPROCprintout
 5800VDU28,20,29,42,3,12
 5810VDU2:start%=0
 5820IF store%=0 THEN 5890
 5830FOR start%=0 TO (store%-1
)
 5840PRINT"MODE ";FNmode(store
p%(start%),storenc%(start%));"
 : VDU ";storev%(start%)
 5850PRINT"COLOUR ";(storel%(s
tart%) MOD64)+128;" TINT ";sto
rel%(start%)-(storel%(start%)
MOD64)
 5860PRINT"COLOUR ";storer%(st
art%) MOD64;" TINT ";storer%(s
tart%)-(storer%(start%) MOD64)
 5870PRINT'
 5880NEXT
 5890dummy%=-1
 5900PRINT'"The 16 colour pale
tte is set up as:"
 5910mo%=16:PROCmsg_pal
 5920PRINT'"The 4 colour palet
te is set up as:"
 5930mo%=4:PROCmsg_pal
 5940PRINT'"The 2 colour palet
te is set up as:"
 5950mo%=2:PROCmsg_pal
 5960PRINT'
 5970VDU3
 5980PROCdelete_window(20,29)
 5990ENDPROC
```

ARCHIMEDES

ROM/RAM PODULE

This podule accepts a variety of ROM or RAM chips and includes ROM and RAM filing system software.



Seven 32 pin sockets can accept any combination of ROMs (16K to 128K) or RAMs (8K to 128K)

Battery and controller chip. Trickle charged battery ensures RAM contents are retained whilst computer is off (optional).

The controller ROM provided contains ROM and RAM filing system software, is fast, and totally Arthur compatible.

Links for battery backup or normal supply

Special controller circuitry automatically detects the type and size of chip plugged into each socket—eliminating 32 links

Edge connector plugs into podule back-plane of 300 or 400 series Archimedes

The board accepts software such as the Archimedes versions of Inter-Word, Inter-Chart and Inter-Sheet and will accept the forthcoming document processor and drawing programs. It is compatible and fully obeys all Acorn podule standards. It requires the back-plane to be installed—available from us and Acorn stockists.

£49.00 + VAT (£56.35) standard
£59.00 + VAT (£67.85) with battery and controller chip

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ACCESS & BARCLAYCARD ACCEPTED

ARCHIMEDES REPORT

Introduction

For this, my eighth report, I provide some further suggestions on the use of ArcWriter. I also preview the Minerva System Delta Plus Card Index database, the Acornsoft ISO-Pascal language, and the Archimedes Programmer's Reference Manual.

Arcwriter

I discussed this word processor at some length last month, in the light of a pre-release version. However, it is currently available free to all Archimedes owners who return their registration cards. So, it is worth mentioning more about its use, and changes to the release version.

File Management

Unlike most word processors for the Model B/Master Series, Arcwriter is disc, not ROM-based. The program files take up 200K, the fonts about 208K, and printer control codes files take up about 40K. So with 448K used up you're left with less than half the disc space left for document files. However, it is possible to load the program, and cause the fonts to be "cached" in RAM, from one disc, and then change to another disc holding only documents.

ArcWriter automatically configures the FontSize – to 10 (ie 40 K) in a 305, and to 52 (ie 208 K) in a larger machine. The former is a compromise, because space is tight all round, but the latter is enough for all 11 fonts (including both the ASCII and international characters). However, if the international characters are not required, the FontSize may be reduced to 24 (ie 96 K), by editing the file "Library.ArcWriter". Although it has the type "BASIC", it will not load into BASIC or the BASIC Editor. The easiest way to edit it is with "Twin" (an optional extra), but it should also be possible using *BUILD and the Arthur line editor.

ArcWriter may "booted" as usual, and automatically "caches" the "Corpus. Medium.12x14" (ie Pica) font, but to cache more fonts requires the loading of a suitable document. One such is "Sample1" on the issue disc, but this must be scrolled to cause all the fonts that it uses to be cached. A better "fontdoc" can be created by entering one lower-case letter, one upper-case letter, and a numeral, for each of the fonts required. (This document could also be used to hold your standard paper size and margin settings). It could be stored on the working copy of the ArcWriter system disc, which may then be write-protected. The "fontdoc" text can then be deleted from memory, by selecting "Set-Up", then "New", and the first disc swapped for the second. This latter may be "mounted" by selecting "Filing" with the "Menu" button, and clicking on "New disc". The fonts currently cached may be listed by clicking on the big "A" (for Arthur), which gives you a white star prompt, and entering *FONTLIST <Return>. <Return> by itself takes you back to Edit Mode.

Printing ArcWriter documents requires the loading of "printer control code files" immediately beforehand (they are not cached). You can either swap back to the first disc (since printing must be from memory), or you can copy one or more of the small (eg 3.5 K) "AW–pccf" files for your printer(s) onto the second, document disc.

Type 1 Display

As I indicated last month, ArcWriter documents look especially good on screen, when using a multi-frequency monitor to display in Mode 20, with 512 scan lines. (see figure a). You should configure the MonitorType to 1, and the ScreenSize to 20 (ie 160 K) – so this requires at least a 310. ArcWriter may then be "booted" up as usual. To change mode, you first click on the big "A", to obtain a system (star) prompt. Then you enter Ctrl-V, Ctrl-T <Return>, POINTER <Return>, and RUN $.!Palette <Return> – either directly, or via an *EXEC file (which however cannot be *BUILt within ArcWriter). This could be named "MODE20", and is best located in the directory "AW–docs". At the white star prompt, *EXEC MODE20 <Return> will change the mode, and <Return> takes you back to Edit Mode. This should be done before loading any document, or cache fonts, since Mode 12 uses fonts of 90 by 45 dots/inch, but Mode 20 uses fonts of 90 by 90 dots/inch.

Solutions for Business, Education and Research

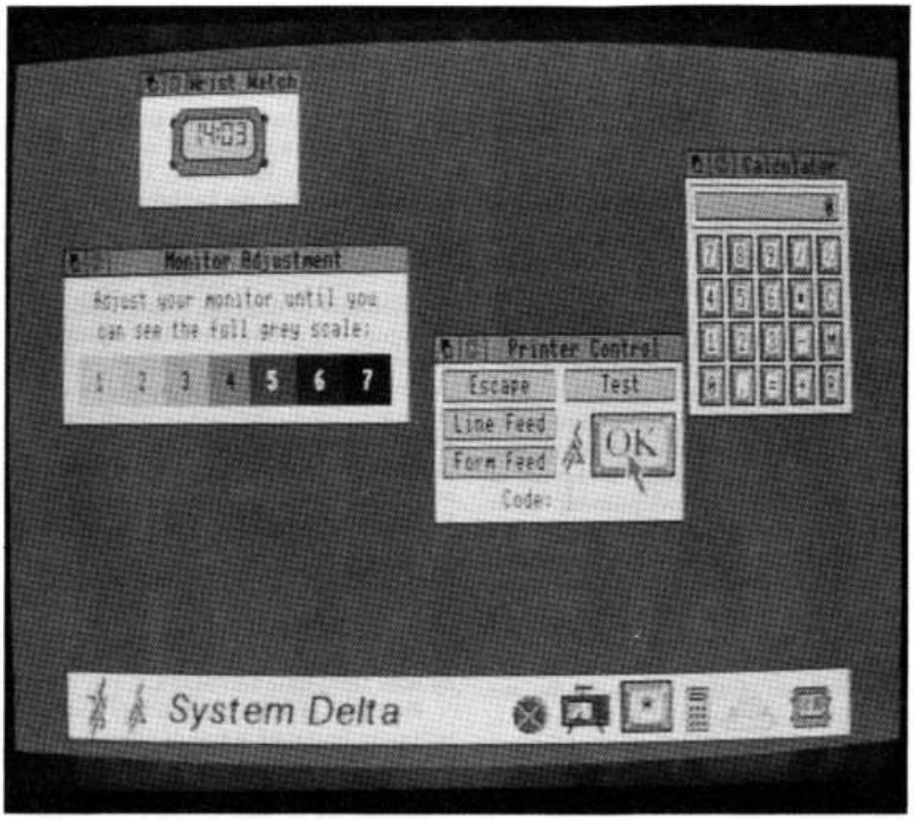
Document Size

The maximum document that ArcWriter can handle is dependant on how much RAM you have, and the current Font and ScreenSize. (The SpriteSize can be as low as 1 – ie 8 K). Both the Font and ScreenSize are reflected in the "bytes free", but ArcWriter keeps two copies of a document, so the change is halved.

As I have mentioned before, you can increase the RAM available by judicious *UNPLUGging of certain modules, to release their workspace. Although, even without doing this up to 182,808 bytes were free (ie about 178K) in a 310. The release version of ArcWriter includes a word count, which shows me that over 11,000 words could be entered without much difficulty. Even so, it can become risky to approach the limit too closely. Warnings are given, but you have the option to ignore them, if you do you run the risk of a machine "hang". The only course of action then is to switch off, therefore it pays not to push your luck (or at least to save your document frequently)!

System Delta Plus

Minerva Systems' System Delta Plus is a programmable database for the Archi-



Creating

Creating a new database involves selecting the File Creation program, and defining the fields, and the format or layout of the record "card" (by "paint-a-screen"). The data types available are: alpha-numeric strings of up to 255 characters, and numeric as integers or as "reals" with up to 6 places of decimals.

All the Minerva databases to date use "hash coding", which implies fixed length fields and records, and the need to define the number of records, and "initialize" the file, before entering data. One or more "keys" (and multiple subsets) may be used for direct access. Compared with System Delta and DeltaBase, System Delta Plus has larger "constraints", with up to 16 million fields per record and 2.14 billion records per datafile being possible in theory. However, these will be limited in practice by the capacity of a single disc – 800 K for a floppy, and eg 20 MB for a Winchester. Unlike the original System Delta, in which datafiles must have only one key, which is the first field by default, System Delta Plus files can have keys on any fields, (including none), and on the values of more than one field combined.

medes, which uses the Acorn Desktop environment, together with the Mouse. It comes with a Card Index application for "flat", single-file databases, and can read and write datafiles from System Delta for the Model B/Master Series, and the lower-priced, non-WIMP DeltaBase for the Archimedes. (I mentioned this latter in A&B, 87/10, p42, a review followed in A&B, 88/1, p72).

More elaborate, multi-file "relational" database applications, such as Accounts suites, and custom systems, can also be written using System Delta Plus. However, I shall discuss only the System Delta Plus Card Index (SD+CI). This product is compatible with all models of the Arc, from 0.5 MB of RAM, and with floppy or hard (Winchester) discs. The issue disc includes a file !Configure for allocating RAM to the various "-Sizes". As a WIMP application, it uses the 80-column, 16-colour Mode 12, but Mode 20 (with 512 scan lines, on multi-frequency monitors) is not supported.

For a "type-set" appearance on screen, the "fancy", anti-aliased fonts may be used in place of the default BFONT. The files for the Medium and Bold versions of a given font (such as Corpus – similar to Courier), should be transferred to the working copy of the SD+CI "system" disc, retaining the same directory structure. These font files are available on the ArcWriter disc (or you can use the Medium files from the Welcome Disc, and copy them again into the Bold directory). The FontSize should be configured to 3 (ie 12 K). Then, before starting SD+CI, enter *SET Font$Prefix $.Fonts, and *SET Delta$Font Corpus. For repeated use, these latter two commands can be added to the !Boot file. When using the "fancy" fonts, writing to the screen is considerably slower, but the effect is nevertheless impressive.

In Use

As with System Delta Card Index and DeltaBase, SD+CI consists of a suite of programs, with a common opening menu, and cross-link options in the lower-level menus. The four main programs are for: creating datafiles, using the database, transferring (record) cards, and sorting (record) cards. A utility program for importing data is also available from the opening menu. Like the Desktop program of the Archimedes, SD+CI has built-in "desk accessories": a multi-function clock, a calculator, and monitor/printer utilities, represented both as "icons" displayed at the bottom of the screen, and as options on several of the menus.

The SD+CI issue disc is protected against complete copying, and should be left "write-protected". Although it can be backed up to make working copies, the program will prompt during loading for the original disc to be inserted as a "key". However, it is possible to load any one of the programs or utilities, and then change to a datafile disc (which must be "write-enabled") when "opening a file". Moreover, the programs automatically "mount" the new disc.

Editing and Searching

After selecting "File Manager", one or more datafiles can be loaded – each in separate windows. Clicking with "Adjust" on the SD logo at the bottom of the screen brings up a "File Information" window listing all the open datafiles, with the actual and maximum (initialised) number of records Clicking on the filename will bring that window to the foreground. Other boxes allow various preferences to be toggled on and off. Data may then be entered or edited.

Each File Manager window contains a "Browse pane" at the top, with "buttons" in the style of a tape recorder, for stepping through the records singly or continuously, forwards or backwards, or to either end. There is a separate "button" for direct searches – by record number (if known), or by a "key" field name and value of at least 3 characters. Sequential searches are available via the Search/List Menu, with a simple search criterion being built by menu selection, and more complex criteria entered directly as expressions. The results of such searches are assigned to one of 32 (or more) subsets. The criteria are not displayed again when you select them, but up to 10 "filter" subsets can be set up, with (meaningful ?) names of up to four characters, and the desired maximum values. All subsets are stored with the datafile, and can be "maintainable" – ie new and changed records are added, if appropriate. The current subset (or the whole datafile, "all cards") may be selected by clicking on the subset name on the right of the Browse Pane.

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Sorting and Printing

Since the records in a SD+CI datafile or subset are held effectively in the order of entry, it may be necessary to sort on the value of a field (or fields). This is done by a separate "Card Sort" program, preferably on a copy of the datafile or subset.

SD+CI datafiles can have more than one "card" layout or format linked to them – for data entry, searching, and printing labels, invoices, and tabulated reports. Minerva will be offering SD+CI Mailshot and Reporter utilities, and links to other applications.

Documentation

The manual consists of a smart A5 ring-binder, containing 18 chapters, along with Contents and an Index. It is easy to follow, with sections 1 to 4 being introductory, 5 to 17 being more detailed, and 18 being a reference section for all the menu options. The file "Info" on the issue disc gives details of recent changes and updates, and there is an option to print them.

The "System Delta Concept" includes the ability to create "specialist" and "custom" systems by writing programs – usually in BBC BASIC – which call many specialised routines written in machine code, and held in a ROM or Relocatable Module. As with the 8-bit System Delta, this requires a Programmer's Reference Manual, which costs £29.95. However, "WIMP-based" applications are much more difficult to write than those which are text/menu-based. Eventually, Minerva expect to upgrade at least some of their "specialist" applications.

Comparisons

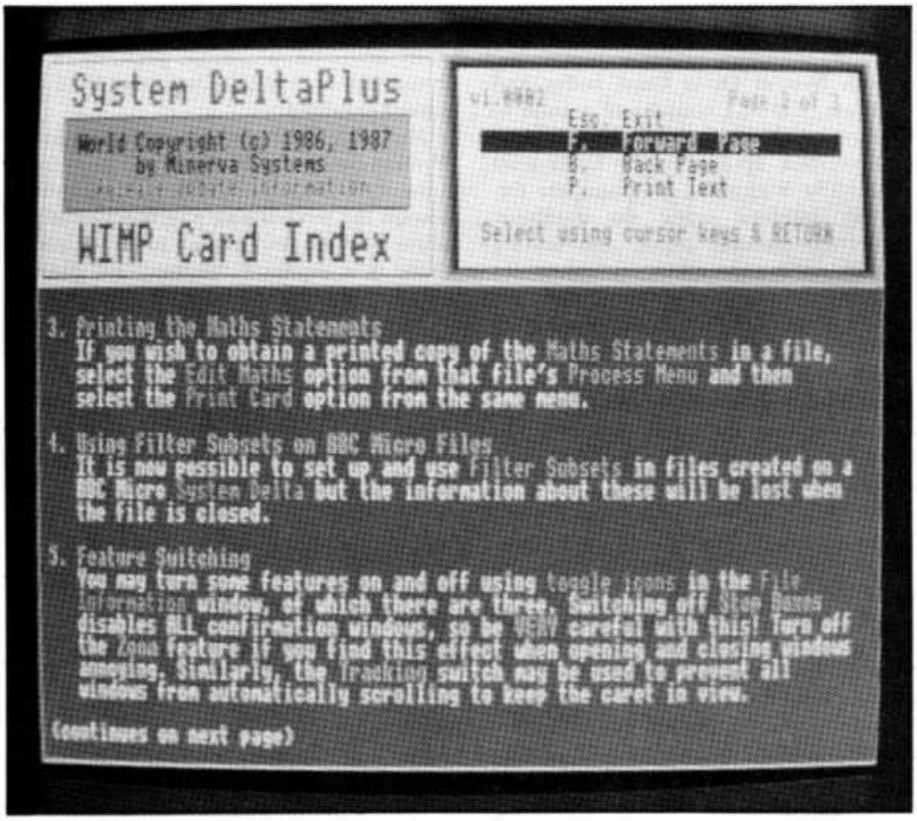
The only other "native-mode" (non-emulator) database yet available for the Archimedes is Minerva's DeltaBase. I found SD+CI, with its WIMP interface, to be easier to understand. Moreover, the ability to have more than window open, containing separate datafiles, could well be convenient in practice, even though they cannot be "related" in this application. The manual terms this "multi-tasking", but it is more correctly "multi-file" operation, since all must use the same program (eg the SD+CI File Manager). However, this does allow browsing or keyed or sequential searching, and printing labels or tabulated reports to printer or disc. For example, if a customer rings up when you are in the middle of one of these operations, you could open a second datafile immediately.

I have compared DeltaBase and SD+CI with the best of the databases for the Model B/Master Series – Inter-Base CI, ViewStore, Mertec Database, and System Delta. The features of the latter are discussed in my review of Inter-Base (see A&B, 9/87, p88). Inter-Base CI and ViewStore can have variable length fields and records, and records can be added as required (subject to filing system limits). Likewise, they can have multiple true indexes (which automatically retrieve records in their respective sorted orders). For all the others (including SD+CI), the maximum length of fields and records must be uniform, and the number of records are fixed when the datafile is first created. Likewise, the datafile can have one key (or more for SD+CI), possibly based on the values of more than one field, with multiple subsets (all in the same sorted order). However, the SD+CI manual states that the forthcoming Super-Delta will be able to have "random" length records, and "binary-tree" organization – which implies scope for "extensible" datafiles, and for multiple, ordered indexes.

Figure 1 shows certain aspects of performance for all six databases on one particular datafile. Where second, shorter times are shown, they apply when records etc are retained in RAM, or "cached", for faster access on second and subsequent searches. Even in a Model B or Master Series, Inter-Base CI and SD CI can "cache" the datafile or current index (the former in up to 63 K of Sideways RAM). However the Archimedes, with much more RAM, gives greater scope for "caching", and this is used automatically by both DeltaBase and SD+CI.

Building an ordered, (sorted) index is necessary for rapid access of "binary-tree" structured databases, such as Inter-Base CI and ViewStore, (unless they are built as records are entered, which slows entry). However, something similar – re-structuring the datafile – is also possible with the Mertec Database. The times taken for indexed (or keyed), and sequential searches may fairly be compared across all six databases. Sorting a datafile is needed more often for the Mertec and Minerva databases, since their records are not necessarily held in the right order for output. However, ViewStore also allows explicit sorting of datafiles. Furthermore, sorting may be considered equivalent to building an index.

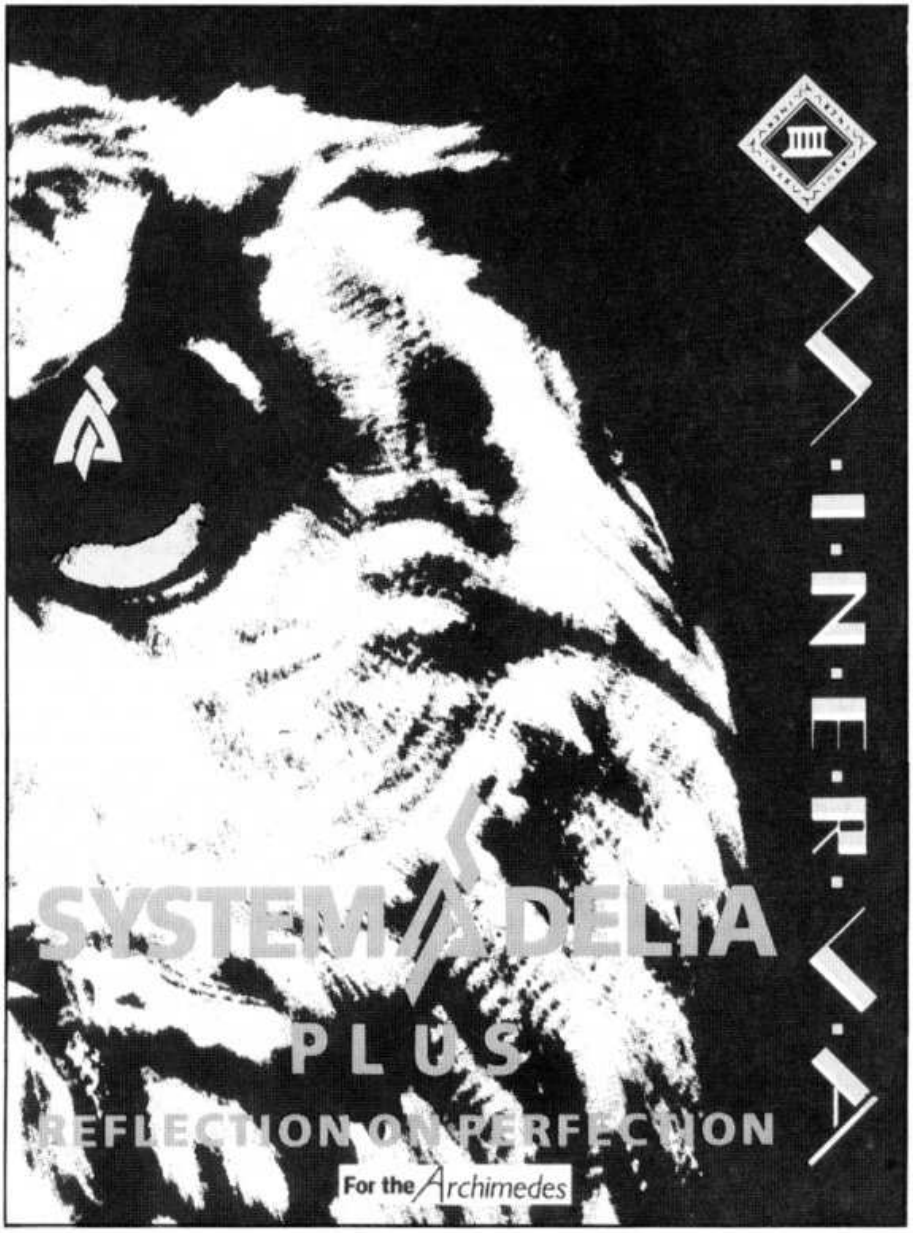
Figure 1 can only be indicative, since the absolute (and hence the relative) times will change with different datafiles and search targets. However, these results show the advantages of "caching", where this is possible, and of the Archimedes over the Master 128, although databases do not reveal fully the differences in processing power and floppy disc filing system speed. A WIMP-based (graphic) application is evidently sometimes slower than one which is menu-based.


System DeltaPlus
World Copyright (c) 1986, 1987
by Minerva Systems
WIMP Card Index
Esc. Exit
F. Forward Page
B. Back Page
P. Print Text
Select using cursor keys & RETURN
3. Printing the Maths Statements
If you wish to obtain a printed copy of the Maths Statements in a file, select the Edit Maths option from that file's Process Menu and then select the Print Card option from the same menu.
4. Using Filter Subsets on BBC Micro Files
It is now possible to set up and use Filter Subsets in files created on a BBC Micro System Delta but the information about these will be lost when the file is closed.
5. Feature Switching
You may turn some features on and off using toggle icons in the File Information window, of which there are three. Switching off Step Beeps disables ALL confirmation windows, so be VERY careful with this! Turn off the Zoom feature if you find this effect when opening and closing windows annoying. Similarly, the Tracking switch may be used to prevent all windows from automatically scrolling to keep the caret in view.
(continues on next page)

Concluding System Delta

System Delta Plus can read and write directly the datafiles of the (8-bit) System Delta, and of the (32-bit) DeltaBase. It includes utilities to import data from several other databases and spreadsheets. SD+CI is the only (native-mode) WIMP-based database for the Arc, which allows multiple files in separate windows. It is also the only one to support the "fancy" fonts.

The performance of SD+CI is competitive and acceptable, and it automatically



"caches" records in RAM for repeated searches. SD+CI datafiles can also be used with future "specialist" multi-file database applications. System Delta Plus, complete with the Card Index application, is available now, at £69.95, inc VAT.

Acornsoft ISO-Pascal

The Acornsoft ISO-Pascal compiler conforms to British Standard 6192:1982, level 1, which is functionally equivalent to ISO 7185. It is thus a complete implementation of the ISO-Pascal standard, and has been created for Acorn by 3L Ltd, of Edinburgh. I tested the release version (1.1), which is available now.

The package includes the standard Acornsoft linker, but no editor or debugger. However, the Acornsoft "Twin" editor works well, and costs £29 plus VAT. Also, the Acornsoft ARM debugger (which is included as standard with the Archimedes, either on the Welcome Disc, or in the System ROM), may be used to examine the resulting object code. (Acornsoft plan to offer a "symbolic, source-level debugger" in a future release of ISO-Pascal – probably at extra cost).

Many Pascal programs will be able to run in an Archimedes 305, but at least 1 MB of RAM is required for compiling and linking. As with Acornsoft ANSI C and Fortran-77, this is possible with Acornsoft ISO-Pascal using only one floppy disc drive. I copied the Floating Point Emulator (fpe250), and the Editor (Twin) onto a separate "setup" disc, which can be common to several Acornsoft compiling languages. Then, after deleting the Floating Point Emulator and the example program from (a copy of) the Pascal disc, there are 284672 bytes free. The compiler and Pascal library have been compressed to about two-thirds size, and are re-expanded on loading. This also speeds loading these files from a floppy disc. If you try to use two floppy discs with only a single drive, after compiling you have to copy the object file from one disc to the other, prior to linking. Hence, to do serious work, you need at least two floppy drives, or better still, a hard disc. When using two floppy drives, one possible arrangement is to put just the "aof" (object) and "img" (executable image) directories and their files on the second drive, and include appropriate qualifiers and arguments in the compile and link commands. Another possibility is to add the "pas" (source) directory and its files to the second drive, whereupon the first disc may be left write-protected, with the second carrying all the program files.

Compiling can be effected simply by entering *Pascal <program> – though it may also be followed by one or more qualifiers. By default, the source file is found in the directory "pas", and the compiled object file is put in the directory "aof" – though these can be overridden by adding qualifiers with arguments. The qualifiers may be in any order (though It's best to keep to the logical sequence). Acornsoft ISO-Pascal loads the source file, and compiles in stages, writing intermediate temporary files to disc by default, and finally the object file to disc. However, the qualifier "-store" results in the temporary files being written into memory, and only the object file being written out to disc. The manual suggests that this only be used if there is plenty of memory (meaning 4 MB), but I found it to be possible for all the (short) programs that I compiled, even in a 1 MB machine. It speeds compilation significantly – particularly with longer programs.

This compiler produces excellent error messages during compilation – eg re missing semi-colon at line end, and re need for "output" as argument in program name. The qualifier "-lis", with a filename as argument, may be used to direct a copy of the source file, along with line numbers, and all the messages issued during compilation, to a file. This can be helpful for editing, and as a record.

Unlike many other compilers, this includes by default checks which produce "extensive diagnostic information in source language terms". Such checks lengthen and slow any program, but the diagnostics only lengthen, correct programs. They only slow erroneous programs. Once you have a working program source, you can use qualifiers to compile it without these checks, so producing a faster and smaller production version. This is especially important when making benchmark comparisons. The qualifier "-noch" (for nocheck) shortens object (and image) files, and speeds execution, while "-nodiag" (for nodiagnostics) shortens the object (and executable image) file, but does not speed execution. The qualifier "-tr" (for trusted) may be used when seeking the smallest file size and run time, but it should be limited to well-proven programs.

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Fig. 1 DATABASE PERFORMANCE COMPARISON

File YRX834 Times in minutes and seconds - disc based/RAM cached

Computer	Master 128	Master 128	Master 128	Master 128	Arc 310	Arc 310
Filing System	ADFS - 640K	ADFS - 640K	ADFS - 640K	ADFS - 640K	ADFS - 800K	ADFS - 800K
Database	C. Concepts I-B C I	Acornsoft ViewStore	Mertec Database	Minerva SD Card Index	Minerva DeltaBase	Minerva SD+ Card Index
Build index	5m 28s/3m 51s	5m 29s	(9m 33s)	-	-	-
Indexed search	4s/2.5s	4s	4.5s	7.5s	3.0s/~0.5s	3.5s/~1.0s
Sequential search	50s/24.3s	40s	33.7s	1m 50s/42s	1m 44s/36s	1m 37s/1m 24s
Sort	-	(1m 27s)	13m 40s	16m 59s	Prototype	3m 44s

Extensions

Certain extensions to the ISO-Pascal standard are accepted by the Acornsoft ISO-Pascal compiler, provided that the command line includes the qualifier "ex" (for extend). The extensions include: non-decimal constants, the reserved word "otherwise" (equivalent of "else") in case statements, handling of variable-length strings (by "padding"), inclusion of other source files, assembly language statements, modules (for separate compilation, and by exported/imported items), and Short Reals. Imported functions and procedures in Pascal programs may be supported by linking with the run-time library of other languages, such as C (which can access many more of the Archimedes resources, such as graphics and sound, via the ArthurLib). I was able to confirm that ISO-Pascal can accept in-line assembler statements (in the PCW "Store" test, see below). It is not yet possible to include imported functions, but this will be available in the next release – intended for mid-88. I used ShortReals in connection with some of the benchmark tests (see below) – and they indeed resulted in execution times being shortened by 30 to 40 per cent.

Acornsoft ISO-Pascal has no direct support for calls to the Operating System. However, these may be handled by using in-line assembler statements (see below). There is no support for overlays, but Acornsoft ISO-Pascal running in Archimedes machines has access to much more RAM than, say, the 64 K normally available to Turbo Pascal programs, or the 640 K available when running under MS-DOS.

The Linker

The Acorn linker (V170) is documented only briefly in the manual. However, entering "*link -help" returns a summary of all the options, and further documentation is available in the two-volume Programmers Reference Manual for the Archimedes, priced at £29. (see below). Since it is common to all the Acornsoft languages, the linker includes no defaults specific to any one language. The first filename after "*link" is taken as the object by default, and there can be more than one, separated by commas. If it/they are not the first, the qualifier "-files" may be used before the file list. The qualifier "-library" must be used with the full pathname.filename of the Pascal library (paslib) (and possibly other libraries) in each link command. The executable image will be written to the currently selected directory by default, but the qualifier "-image" may be used with another pathname.filename. Finally, the type of linked file produced may be set by a qualifier. Eg setting "-adfs" implies "-base 32K -nopagealign -noblockalign" – suitable for running in the Archimedes is the default. The implied "-base" of 32 K controls the load/execute address at 32 K = &8000 – that for the Systems and Applications area, as for BBC BASIC 5. Again the qualifers may be in any order.

Programs that have been successfully compiled and linked may then be executed or run. *<program> is sufficient if it is in the current directory, otherwise *RUN pathname.filename (eg img.<program>) is necessary. ISO-Pascal can also produce run-time messages, in respect of errors that passed compilation and linking. Moreover, provided that they have not been disabled, the diagnostic messages allow errors to be located in the source program.

Byte benchmarks

A Pascal source listing of the Byte Sieve test is given in Byte Sep. 1981, p 182, but for the Byte Floating Point Benchmark, I translated the C listing given in Byte, July 1987, p 103. With Acornsoft ISO-Pascal, adopting ShortReals for the "bfloat" test gave a shorter run-time. These are single precision, like the Reals for the other Pascals, whereas the Reals for ISO-Pascal are double precision.

In figure 2, the compile and link times shown for an Archimedes 310 with floppy drive using Acornsoft ISO-Pascal were measured using the "-store" qualifier (see above). While shorter than for a PC-XT (ie with a hard disc) using Microsoft Pascal, the times are much longer than when using Turbo Pascal. The size of the compiled (and linked) code produced by Acornsoft ISO-Pascal is similar to that produced by Microsoft Pascal, though appreciably larger than that produced by Turbo Pascal.

Running the Byte "sieve" test, the Archimedes 310 with Acornsoft ISO-Pascal 1.1 takes 1.5 s, while a PC-XT with Microsoft Pascal 3.21 takes 7.3 times as long, and with Borland Turbo-Pascal 3.0 takes 8.7 times as long. To run the Byte "bfloat" test, using Floating Point Emulation, the Archimedes 310 with Acornsoft ISO-Pascal takes 13.2 s, while a PC-XT with Microsoft Pascal takes 0.76 times as long, and with Borland Turbo Pascal takes 2.5 times as long. However, with some compilers, optimization will cause this test to be speeded greatly, and again with some compilers, even non-8087 code will "find" the 8087 hardware Floating Point Unit, and execution is speeded. (see Byte Sep. 1987, p 110). Hence this benchmark does not give a fair comparison of overall floating point performance without a hardware FPU fitted. This is shown better by the PCW RealMath test (see below).

PCW benchmarks

The Pascal source listings for the PCW benchmark tests are given on the chart published with Personal Computer World, November 1987. With Acornsoft ISO-Pascal, adopting ShortReals for the RealMath test gave a shorter run time. These are single precision, like the Reals for the other Pascals, and meet the 6-digit requirement specified by PCW. In the case of the "Store" test, the source listing given on the chart required several changes (including the use of in-line assembler statements to *DELETE the file), since ISO-Pascal has no other facility for accessing the Operating System directly.

In figure 3, for the IntMath test, the Archimedes with Acornsoft ISO-Pascal takes 0.024 s, whereas an IBM-PC with Borland Turbo Pascal takes 7.5 times as long. Moreover, for the RealMath and TrigLog tests, the ratio is some 15.7 times. Since for floating point calculations without a hardware FPU, Turbo Pascal 3.0 is much faster than earlier versions, this ratio overstates the advantage of Acornsoft ISO-Pascal, but it is probably around 7

Fig. 2 BYTE BENCHMARKS USING PASCAL

Program	Machine	FPU	Pascal	Source code size - bytes	Compile+Link time - s	Compiled code size - bytes	Run time - s
sieve	Arc 310 +floppy	No	ISO-	560	49	28836	1.5
	PC-XT	Yes	MS	768	54	29600	11
	PC-XT	Yes	Turbo 3.0	768	2.7	11495	13
bfloat	Arc 310 +floppy	No	ISO-	461	48.2	28556	13.2
	PC-XT	Yes	MS	384	65	29954	10
			MS + 8087	384	63	29708	4
	PC-XT	Yes	Turbo 3.0	384	2.6	11485	33
			T + 8087	384	2.0	10334	7

Some results from Byte Feb. 1986, p 274

times as fast. On the TextScrn test, the Archimedes with ISO-Pascal is the fastest by far.

The PCW Index is the geometric mean of the times for all seven possible tests for an IBM-PC running BASICa, (24.00848 s) divided by the geometric mean for the results obtained, of which there must be at least five. For the Archimedes running Acornsoft ISO-Pascal, the PCW Index is 27.5, whereas when running Acornsoft ANSI C, it is 34.9. Moreover, the ratios of the times for Pascal and C are IntMath 1.5, RealMath 1.34, TrigLog 0.95, TextScrn 1.11 and Store F 2.15. Hence there will rarely be any speed advantage in using Pascal in place of C. However, the real merit of Pascal is that it is more rigorously defined, and hence better suited for teaching and learning, and for use in large projects. Also, of course, it enables the running of existing Pascal source code with few if any changes.

The PCW Index for the Archimedes 310 with Acornsoft ISO-Pascal is about twice that for the RM Nimbus with Pro-Pascal. This is consistent with the PCW Index for the Archimedes 310 with Acornsoft ANSI C being also about twice that for the RM Nimbus PC1 with Zorland C (see A & B, January 1988, p 67).

With Acornsoft ISO-Pascal, program size is limited by that of the object (as opposed to the source) code. It is not subject to the 64 K limit of Turbo Pascal (although this is sufficient for some 4000 lines, when using Turbo-Pascal 3.0 – see Byte, Feb 1986, p 284 – and even this can be overcome by "chaining"). Moreover, unlike those running under MS-DOS, which are limited to less than 640 K, languages and applications running on the Archimedes are limited solely by the RAM available – eg nearly 4 MB on a 440. I tried no large programs, but 3L report that they have compiled and linked a 4000-line program using ISO-Pascal in a 1 MB Archimedes, even when using the "-store" qualifier.

Documentation

Any serious Pascal programmer will need the Pascal User Manual and Report, by Jensen and Wirth – preferably the Third Edition, which includes details of the changes due to the ISO-Pascal Standard. This is published by Springer-Verlag at £11.90. Indeed, the manual for Acornsoft ISO-Pascal assumes that the user is conversant with this standard. However, within this limitation, it is well-organized and includes many examples, both of standard Pascal and of the extensions. The latter are particularly useful, since they are not likely to be covered in textbooks (which naturally concentrate on standard Pascal). Indeed, the manual could with advantage give more detail of the usage of such extensions. However, Appendix A includes complete details of compile-time messages – errors 1 to 173 – and Appendix B contains details of 25 run-time messages. There is also a detailed Table of Contents, and an Index.

Conclusions on ISO-Pascal

ISO-Pascal is a very well-defined, but somewhat limited language. Almost all implementations of Pascal include substantial extensions, which make it both less rigorous and less portable. Even with its extensions, the Acornsoft ISO-Pascal is much more limited than the Acornsoft ANSI C, in having neither direct access to the Operating System, permitting the embedding of star commands and SWIs, nor to other machine facilities, (such as the Acornsoft ANSI C offers via Arthurlib). Moreover, compared with Borland's Turbo Pascal for PC's, it lacks many extensions – eg string manipulation, screen/cursor control and screen windows. However, Acornsoft ISO-Pascal can apply excellent checks and diagnostics, which make it well-suited for teaching and for major programming projects.

The Byte and PCW benchmark results show that an Archimedes 310 with Acornsoft ISO-Pascal executes programs much faster than many other machine/Pascal combinations, when no hardware Floating Point Unit is fitted. The speed of writing to the screen is particularly impressive. Floating point calculations may be speeded by fitting such hardware (and – in the case of most MS-DOS compilers – linking with corresponding libraries). However, Acorn plan to offer a hardware FPU for the 400 Series, for which no change to the object code will be necessary.

Finally, at £99 plus VAT, Acornsoft ISO-Pascal is competitive with other inexpensive Pascal implementations, and costs much less than the "heavyweight" Pascal compilers available for use under MS-DOS.

Reference Manual

The Programmer's Reference Manual for the Archimedes is in two volumes – of some 350 and 300 pages – in the same large format as the Welcome and User Guides, together with a slim addendum. The two volumes each have global Tables of Contents and Indexes.

In effect, this is Acorn's Advanced User Guide for the Archimedes and the Arthur

►►

Fig. 3 PCW BENCHMARKS AND INDEXES USING PASCAL

Machine	FPU	Pascal	IntMath	RealMath	TrigLog	TextScrn	GrafScrn	Store F	Store H	Index
					Times	in	seconds			
Arc 310	No	ISO-	0.024	0.255	3.55	3.0	-	7.8	-	27.5
RM Nimbus PC1+8087	Yes	Pro-	0.08	0.16	1.1	46.9	3.56	10.16	-	14.15
Apricot PC	Yes	Pro-	0.26	0.36	1.76	64.5	-	13.2	-	8.93
Apricot XEN	No	Turbo	0.02	1.34	12.85	33.8	-	13.34	4.17	8.16
Acorn 32016/6	Yes	ISO-	0.06	0.1	2.9	13.77	35.82	29.28	11.66	7.68
Apricot Xi	Yes	Turbo 3.0	0.12	0.86	1.68	68.75	-	15.2	6.45	7.40
Amstrad PC1512	No	Mystic	0.12	1.25	-	80.21	9.23	10.4	-	5.86
Apple Mac	Yes	Turbo	0.043	4.6	8.4	51.5	15.1	10.4	-	4.92
IBM-PC	No	Turbo	0.18	4.0	56.2	76.4	5	-	4.9	3.69
Amstrad PC1512	No	HiSoft	1.7	2.8	22.6	60	39.9	10	-	2.05

Some results from PCW Nov 1987 chart

Operating System. Many features (such as *FX calls) are the same as – or more often supersets of – those for the Model B/Master MOS. However, the length and content of these two volumes gives an excellent indication of the talent and effort needed to create the largest micro-computer operating system so far. The achievement is all the greater because it is all in ROM, which is much more convenient in use, and saves RAM.

On the Archimedes, programs access operating system routines by using a SWI instruction – where SWI stands for SoftWare Interrupt, one of the built-in instructions of the ARM processor. SWIs are somewhat "lower-level" than "star" commands, and there are about 150 in the Arthur operating system, with scope for many more to be added as required – both by Acorn and third-parties. Many features are also available via "star" commands, which may be issued at the "system" prompt, or embedded in programs (eg in BBC BASIC or "C"). They fall into three groups – the Arthur MOS Utilities, the filing systems (eg ADFS), and the "relocatable modules" in ROM or RAM (which are analogous to "sideways ROMs" in the Model B/Master Series).

Clearly it is vital for programmers to know the full extent of the resources provided. For example, as an alternative to OS–WriteC – Write Character, OS–WriteN – Write a Counted String, can greatly speed writing text to the screen, and instead of the VDU PLOT command, OS–Plot – Perform a Plot Command, plots graphics much faster. Another topic, new with the Archimedes, is memory management. This chapter shows how memory is allocated, with an example of complete accounting at "-Size" granularity (ie in blocks of 8 or 32 K).

Among the (relocatable) modules in the "system" ROM, are those for Sprites, the Window Manager, the Font Manager, and Sound – with a chapter for each. That on the Font Manager mentions the two "star" commands – *FONTCAT to list the fonts in a given directory on disc, and *FONTLIST to show which fonts are currently held in the font "cache" in RAM (ie that set with *CO. FontSize). Both are particularly relevant to ArcWriter (and other products using the "fancy", anti-aliased fonts). The Addendum includes the most recent developments, such as Multiple Module Instantiation, which notably affects the Sound system. This allows modules to have many workspace areas, but only one code area. For example, WaveSynth, in addition to the first incarnation (which becomes "WaveSynth% Base"), can have a second incarnation, such as WaveSynth%Brass. This is thus added to the number of voices that may be used – eg by the Music Editor.

The later chapters and appendices document the Acorn Linker, and the ARM Debugger, which are both of interest to users of compiling languages, and the Econet and Podule expansions.

The above can only hint at the full contents, but may help to convince those who ought to have the Archimedes Programmers' Reference Manual. It is available now, at £29.

Conclusions

ArcWriter is an excellent demonstration of the "fancy", anti-aliased fonts provided for the Archimedes – particularly when using Mode 20 on a multi-frequency monitor. Moreover, the font files can be "cached" in RAM from a "set-up" disc, thus leaving much more room on the "document" discs. The release version allows documents of up to about 11,000 words in a 310 – with more by "UNPLUGging" modules. Since it has all the essential features, and is quite fast, even with the "fancy" fonts, ArcWriter makes a very acceptable word-processor – especially while it is "free".

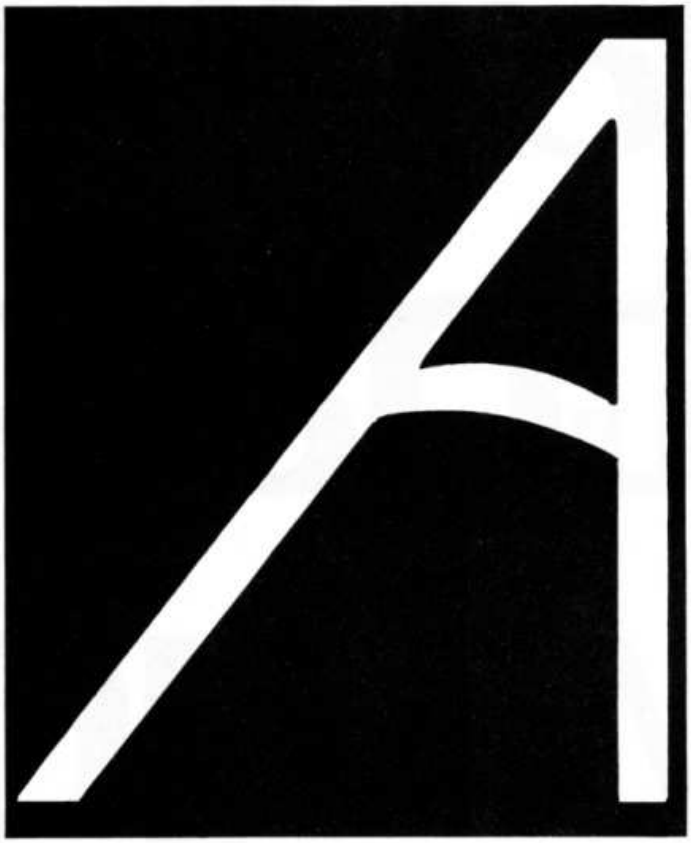
The System Delta Plus WIMP Card Index is highly compatible with other Minerva products, and allows multiple datafiles to be opened in separate windows (though not "related"). It too can use the "fancy" fonts, and (with the usual BFONT) has a competitive performance, and a price equal to or less than some databases for the Model B/Master Series.

Both ArcWriter and System Delta Plus are true Archimedes applications, running in the 32-bit "native mode". They thus show what it offers over the 8-bit Model B/Master Series, and the 16-bit MS-DOS machines (both of which it can also emulate), and are only the first such applications of particular interest to business users.

ISO-Pascal, with ANSI-C and Fortran-77, are the three major compiling languages already available for the Archimedes from Acornsoft. By complying fully with the relevant standards, these – and their planned developments – help to make the Archimedes very attractive in the educational and research markets.

Factfile

- **Acornsoft are at: 645 Newmarket Road, Cambridge, CB5 8PD. ☎ (0223) 214411.**
- **Minerva Systems are at: 69 Sidwell St., Exeter, Devon, EX4 6PH. ☎ (0392) 37756.**



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- Articles about BASIC V

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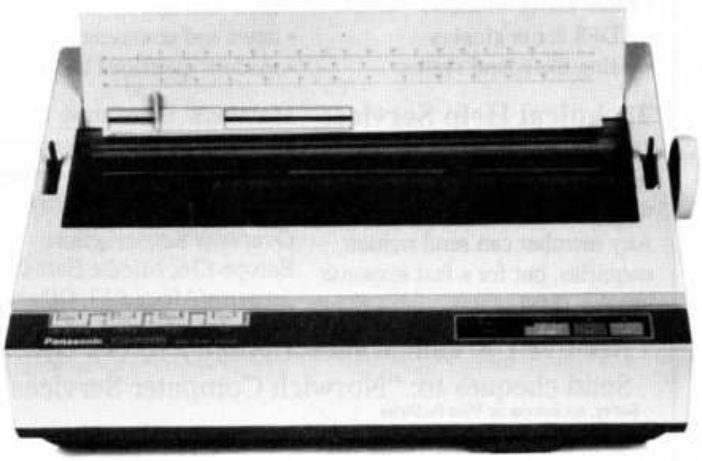

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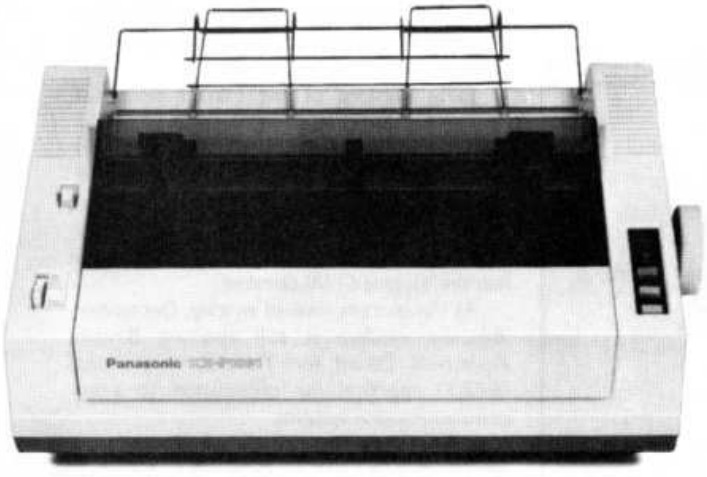

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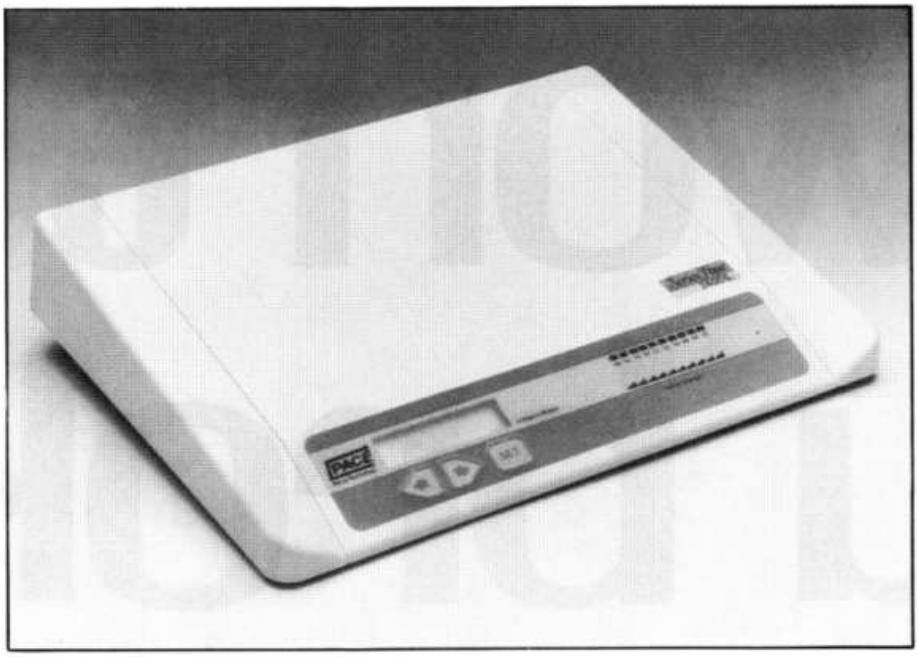


Pace modem or plastic pancake?

Farmers get online

A new online computer users group has been set up on Microlink, to help UK farmers make better use of their micros.

The British Farm Computer User's Group (BFCUG) is organised by Andrew Cooley, the project co-ordinator for on-farm systems with the Milk Marketing Board. "My experience is that many farmers are already exploring the potential of micros beyond their use in day-to-day management", he said. "But they suffer, perhaps more than managers in any other business, from the isolation inherent in farming itself".

"The primary aim on BFCUG is to overcome this isolation so farm computer users can share their ideas and experiences and get the maximum value from these immensely powerful management tools".

Initally Microlink is providing a farming section on its bulletin board, but eventually BFCUG will become a closed user group (CUG) on the system.

Support for the new organisation has come from Dr John Craven, head of the Milk Marketing Board's farm management services, and from leading farm software supplied Farmplan and Sum-It.

- **For further information contact: Andrew Cooley, BFCUG, on ☎ 0789-254056**
- **Mike Cowley, Microlink, on telephone 061-456 8383, Telecom Gold mailbox 72:MAG001.**

Internal Master Modem on the way (at last)!

Over a year ago Pace Micro Technology announced that they were going to produce a Master Internal Modem. However, after many delays, Pace's Marketing Manager, Barry Rubery, confirmed that they have dropped the project.

However, BEEBUG Ltd. have announced that they are going to produce an Internal Master Modem of their own. Priced at £119.00 (or £113.05 to BEEBUG members) plus £3.75 carriage, it offers V21 (300/300) and V23 (1200/75) modes of operation. Both Tone (DTMF) and Pulse (Loop disconnect) dialing can be achieved, as well as V25 auto-answer.

The modem fits to the right of the Master's Power Supply Unit (PSU), and connects to the computer via a ribbon cable to a socket already provided on the circuit board. Interestingly, the modem offers line monitoring through the computer's loudspeaker. No soldering is required to fit it.

Bell tinkle suppression is provided thanks to three-wire operation, with the modem plugging into a standard BT 600 PSTN socket.

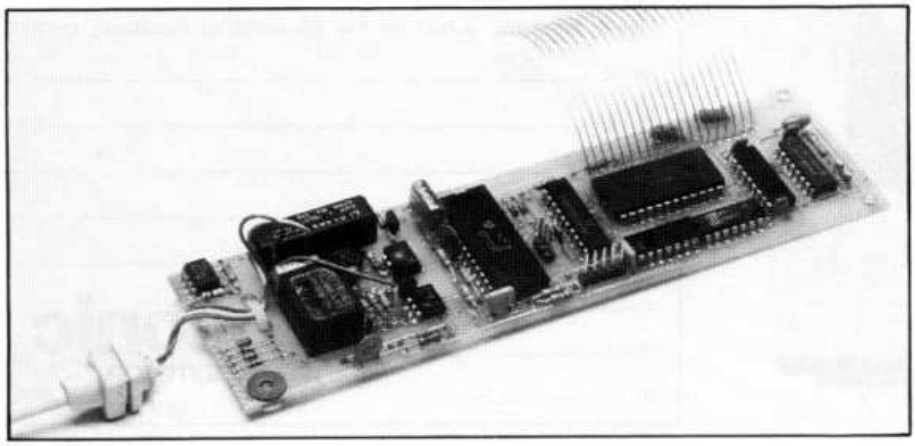
Software to control the modem comes in the form of an adapted version of BEEBUG's Command ROM, which is supplied with the modem.

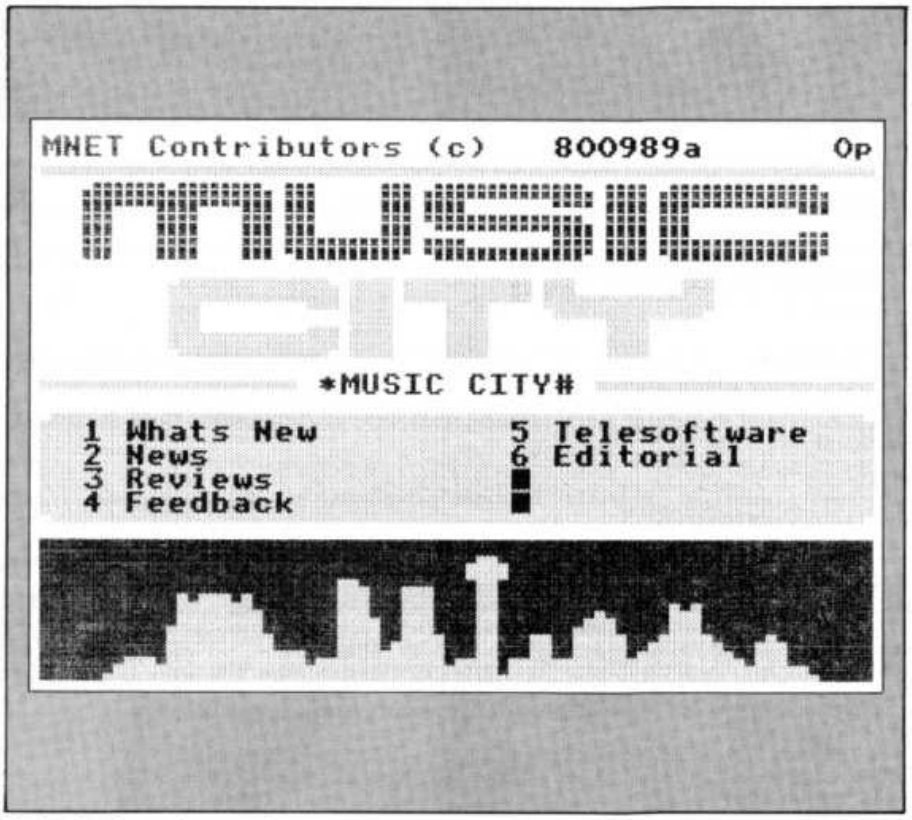
Early versions of the Master series of microcomputers had their battery packs located in the modem fitting position. If you are going to use the internal modem you will need the new style battery packs which sit to the left of the keyboard. BEEBUG can supply such packs for £3.68 (or £3.50 to BEEBUG members), plus £1.00 carriage.

At the current time of writing, December '87, the modem is still awaiting **B**ritish **A**pprovals **B**oard for **T**elecommunications (BABT) approval for connection to telecommunications systems.

- **For further information contact: BEEBUG Limited, Dolphin Place, Holywell Hill, St. Albans, Herts., AL1 1EX. Telephone 0727-40303, Prestel just key *BEEBUG#.**

Internal modem – and the competition is hotting up.





Music city – for ample users only.

Music City on Micronet

Micronet Ltd. has announced a new database for computer music fans, called **Music City**. The database opened its doors during December '87, and offers an on-line magazine covering computer music, with music software that can be downloaded and played on a home microcomputer. Although it is hoped that all aspects of computer music will be included, initially the service will concentrate on the Hybrid Music System for the BBC series of microcomputers.

"Once again we're exploiting the medium (Viewdata) to its best advantage", commented Micronet's software Manager, Phil Godsell. "Any magazine can write about computer music, but how many can supply its readers with music files for use there and then?"

Micronet has also taken a lead over the issue of music copyright, and has reached agreement with the Mechanical Copyright Protection Society (MCPS) whereby royalty payments will be made whenever appropriate. "If a piece of music is subject to copyright then it doesn't matter whether its played on a home micro or by an orchestra – if you ignore copyright you're breaking the law", adds Phil Godsell. "By talking to the MCPS Micronet is taking a lead which we hope others will follow".

Chris Jordan, head of Hybrid Technology said, "I'm obviously delighted that Micronet has decided to launch a computer music magazine that will cater for the Hybrid Music System, and I'm particularly pleased that they will be paying composers their dues, thus gaining legal access to a much wider range of music".

Apart from offering a selection of music and instrument files for the Hybrid Music System, Music City will cover the latest developments in computer music, review related hardware and software, feature general articles on computer music, and include a letters/contacts section.

"There are thousands of owners of the Hybrid Music System out there today", commented Micronet's Marketing Manager, Lynne Thomas, "and although a substantial number are already Micronet subscribers, we expect many more to join".

● **For further information contact: Micronet, Telemap Limited, Durrant House, 8 Herbal Hill, London, EC1R 5EJ. ☎ 01-278 3143, Telex 295141 TXLINK G A/C 223681485, Fax 01-833 4136 or log-on to Micronet and select page *8009890#.**

Telemap Establishes Videotext In Italy

Telemap, the British Telecom/EMAP/Bell Canada company behind Micronet, is expanding overseas by becoming a major shareholder in a new Italian company, launched on the 26th November 1987 in Milan, called LogOn Technology SLR.

The new company will operate on-line products and offer an extensive range of videotext support services – ranging from consultancy to the supply of communications systems – to information providers in Italy.

LogOn Technology's first on-line product is a microcomputing service called Lasernet 800, which includes many of Micronet's most popular features, and is based on Italy's national videotext system, Videotel, operated by the Italian state telecommunications company, SIP.

Lasernet 800, which is being backed by a substantial promotional campaign in the Italian computer press over the Christmas period, will also benefit from various initiatives by SIP and several major hardware manufacturers to distribute free and low cost modems.

Telemap's partners in LogOn Technology are CELINT SRL, a manufacturer of communications hardware and systems, and Laser Communications SRL, a major residential electronic publisher. The Chairman of the company is Signor Luigi Bellato (Managing Directory of CELINT) and the Managing Director is Signor Simone Majocchi (Managing Director of Laser Communications). Telemap director Tom Baird is also on the board.

"...once again Micronet are exploiting the medium to the full..."

Mike Brown, Telemap's Technical Director, who becomes Vice-Chairman of LogOn Technology, commented, "The scene is set in Italy for a dramatic expansion in the use of data communications systems both in the business and residential sectors. The new company promises rapidly to become the most successful supplier of videotext technology in Italy and the leading service provider to the home microcomputer user, as well as a valuable partner for Telemap in the international market".

As a result of the arrangement between Telemap and LogOn Technology, the new company will have access to a range of Telemap products, including the multi-user game, Shades. Signor Simone Majocchi said, "Through our relationship with Telemap, LogOn Technology will have access to five years of expertise in videotext and a range of successful products. This combined with our local knowledge and experience puts the new company in an unrivalled position in the Italian videotext market".

● **For further information contact: Micronet, Telemap Limited, Durrant House, 8 Herbal Hill, London, EC1R 5EJ. ☎ 01-278 3143, Telex 295141 TXLINK G A/C 223681485, Fax 01-833 4136.**

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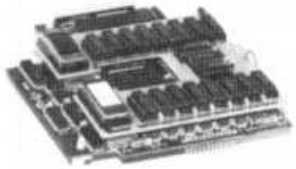

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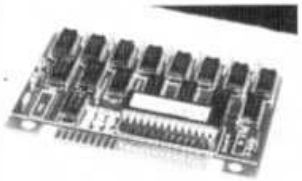
It has a mouse, 512K of RAM, 10MHz — 16 bit CPU (around 3 times the speed of the normal PC), 4 software discs containing the Digital GEM operating system, a wordprocessor, a painting program, CPM emulator and other utilities.
Price: **£239 inclusive.** Your BEEB must have a WD-1770 and ADFS.
Data sheet available on request.



THE PC-PLUS:
The PC-PLUS is an expanded PC-500, with one Megabyte of RAM instead of 512K. The extra memory allows large applications such as Desk Top Publishing (eg Fleet Street Editor) to be used on the BEEB or the MASTER.
The PC-PLUS is supplied with the same accessories as the PC-500 including the mouse and 4 discs. Price **£339 inc.**
Upgrade from an existing Acorn 80186 costs **£119.00** but you will be required to sign a service agreement. Please ring for details.
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MASTER MEGA CARD:
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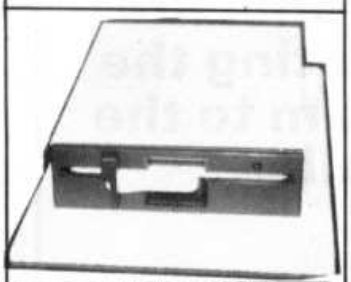

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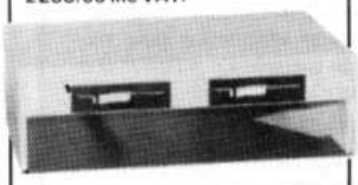

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The new Acorn Disc Filing Systems DFS and ADFS require both the WD-1770 chip. Solidisk offers two basic WD-1770 models which are totally compatible with the Acorn DFS/ADFS ROMs. We also offer our own DFS 2.2 and ADFS 2.1 ROMs which have a superset of utilities and commands. Data sheets on these ROMs are available on request.
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Data sheet available on request.
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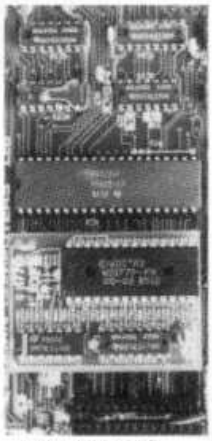
DFDC with DFS 2.2 ROM	**£50.00 inc.**
DFDC with ADFS 2.1 ROM set	**£55.00 inc.**
DFDC with 2.2 and 2.1 set (3 ROMs)	**£63.00 inc.**

Data sheet available on request.



WD-1770 DFS

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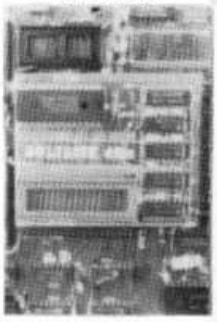
It's the ideal upgrade for all Beebs, with more ROM sockets and even bigger memory than the Master! Compatible with Computer Concepts InterWord, Sheet and Spellmaster, Acorn View 3.1, ViewSheet, ViewStore and Basic, it is supplied with a quantity of useful software on five discs, eg database, spelling checker, macro basic, Ramdisk for STL DFS and ADFS etc.
A clever switch write-protects only the 8 banks of Sideways RAM, without affecting the Shadow RAM. *Price: ex VAT:* **£52.17, inc VAT £60.00**



1770 + 8271

FOURMEG 256K:

256K RAM (shadow and/or Sideways) 4 extra H/C ROM sockets on board (4 on BBC motherboard), 4MHz switchable CMOS 65CO2 cpu, 32K Manager ROM. *Price* **£110.00 inc VAT.**

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Special Offer on InterWord and Wordwise Plus when purchased with any TWOMEG or FOURMEG board:

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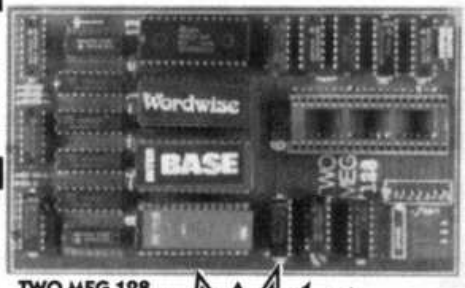

TWO MEG 128

REAL TIME CLOCK:

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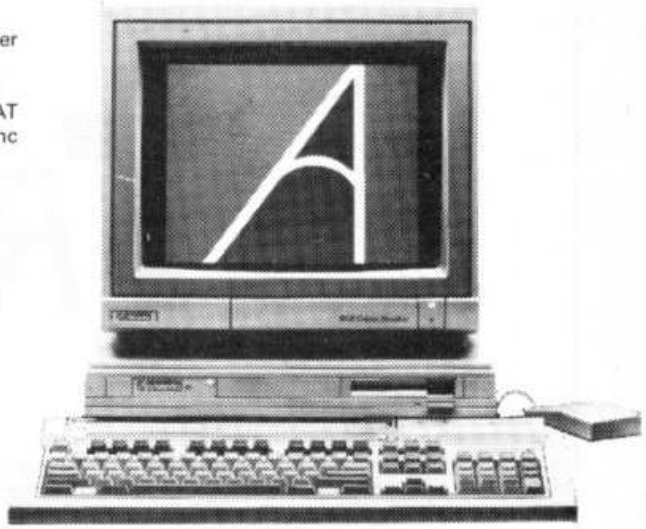

Please note:
Many packages such as Acorn Arc-Writer or Logistix leave little room on the program disc so that a second drive is very useful. Unless you plan to get the 20MB Winchester, our external drives (eg FD35A) are good and low cost.
If you are going to use the MS-DOS Emulator, we recommend our FD525A, 40/80 track switchable because most PC software is still supplied on 5¼" format. For 100% media compatibility, you will need a 40-track double sided 5¼" drive, such as our PC525 (see below).
The way the new Arc software is going, everyone will sooner or later send to upgrade the memory to 4 Megabytes (and even beyond). If you can't afford an A440 now, you can trade-up from your 305 Plus. We will normally allow you 85%-95% of our invoice value.

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COMPACT 128K:

	Without monitor		Acorn monochrome		Acorn colour	
	ex VAT	inc VAT	ex VAT	inc VAT	ex VAT	inc VAT
Compact 128K:	347.80	399.97	391.30	449.99	521.00	599.15
Compact 128K, CDFS ROM and a second disc drive, A, B or C:	434.00	499.10	478.00	549.70	608.70	699.99

A = twin 3.5" drives, B = 5.25" drives, C = one 3.5" and one 5.25".
Twin drives are usually required for disc copying, the Solidisk CDFS complements the Acorn ADFS with a superset of DFS commands and utilities such as single and double density, copying DFS discs to ADFS discs etc.

MASTER 128K:

	Without monitor		Philips monochrome		Philips colour	
	ex VAT	inc VAT	ex VAT	inc VAT	ex VAT	inc VAT
Master 128K:	391.00	449.65	455.00	525.25	574.00	660.00
Master 128K with Twin disc drives:	556.50	639.97	635.00	730.25	730.43	839.99

The MASTER 128K comes bundled with Wordprocessor (View), spreadsheet (ViewSheet), Terminal software, DFS and ADFS. The monochrome monitor is 12", can be with green (BM7022) or amber (BM 7522) phosphor, the colour monitor is 14" CM8833 with all imaginable inputs! (The Acorn colour monitor is a badged version of the latter.)
PLEASE NOTE: generous TRADE-IN allowances are available for upgrading your present system. Please call for immediate quotation.

TELETEXT AND TV ADAPTER

This unit includes a programmable TV tuner, a teletext adapter and a mains power supply unit. It has one input for the aerial and two output sockets. One socket is for connection to the computer and the other for composite video and sound, for connection to a suitable monitor such as the Philips CM8833. It is supplied with software on disc for any of the following computers: BBC model B, Master, Compact, Arc, ST and Amstrad PC. Unlike the ATS ROM (Morley version) with which it is fully compatible, it can download software for any other computer than the BBC. It can be used as a conventional TV tuner, except that channel selection is done by software and the details saved to disc (so that you can watch football at work!). Price: £99 inc. VAT (please specify computer and disc format).

IMAGE-MASTER:

This cost-effective video digitiser converts directly composite TV signal (camera, VTR, teletext adapter etc) to computer display. Image-Master resolution: 640 × 256 by 16 colours or shades but the computer display resolution is limited by your computer. Available for Arc, BBC, Master, Compact, ST and Amstrad PC. Price: from £60 inc. VAT (Please specify your computer, Arc model requires our user port podule). There are one input (composite video in) and two outputs (video out and to computer), 3 knobs (brightness, contrast and aspect ratio). The unit should be used with a suitable monitor such as the Philips CM 8833.

ADVANCED IMAGE-MASTER:

This digitiser can not only convert video signal into computer data, it can be used as a super colour display for the computer and replaces a GENLOCK device for picture over picture. It is capable of 4096 colours, 640×256 pixels and output for recording onto video tape or RGB (analog) monitor. There are two inputs (computer display in and camera) and 3 outputs (VTR out, Analog RGB out and computer data). Available initially (JAN 1988) for Arc and ST. Price £180 inc. VAT. Data sheets are available on request.

****

DTP SYSTEM INC. LASER PRINTER: £2499 + VAT!

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Des Thomas

TRESSEL

Profile

In 1980 a small group of teachers in the Brighton area came together to discuss the subject of curriculum development. They were critical of the existing system of educational publishing and were unhappy with the constraints imposed by textbooks on teaching methods. While they approved of the the move towards school based curriculum development, I wonder how they feel about the idea of a national curriculum?

Their feeling was that the Schools' Council had not done enough to turn theory into practice. They decided to form a curriculum development group that was self financing – this led to a Teachers' Publishing co operative, owned and run by members of the teaching profession and producing materials designed and developed by the classroom teacher for other classroom teachers.

The motivating force behind their efforts was a belief that the school curriculum was in need of a change, and that certain teaching methods and learning experiences has to be encouraged. Tressell's principal aim is to assist teachers to promote active learning in the Humanities and now they are known as the producers of materials which encourage young people to "study a wide range of historical evidence, in order to question, to make judgements, and generally become actively involved in the learning process are all the hallmarks of Tressell's materials – both booklets and computer assisted learning packages."

One of the first booklets they published was entitled *"Into the Unknown"*. It gave details of a simulation based on a 15th Century Portuguese exploration of Africa, developed by David Simkin over a period of several years for use within a 3rd year secondary history course. Its potential for development as a computer simulation was recognised by a primary school headteacher, my colleague David Marshall, and the rather painful, yet successful entry into computer software publication was well-documented in their book, *Curriculum Development in Action*.

When I began to put together the packages for this article, I wondered whether it would be fair to include their first package, *Into the Unknown* as, after all, how much of the software written four years ago, (which often was cassette based) can be compared with that produced today?

I Decided to include it for three reasons: I was a little nostalgic, it took second place in Educational Computing's Top 20 programs for 1984 and lastly, because it sets the pattern for all Tressell's computer assisted learning packages.

Into the Unknown

The first thing to note about *Into the Unknown* is that, by producing a package in which the software element is just one part – albeit an important one – in 1984 Tressell

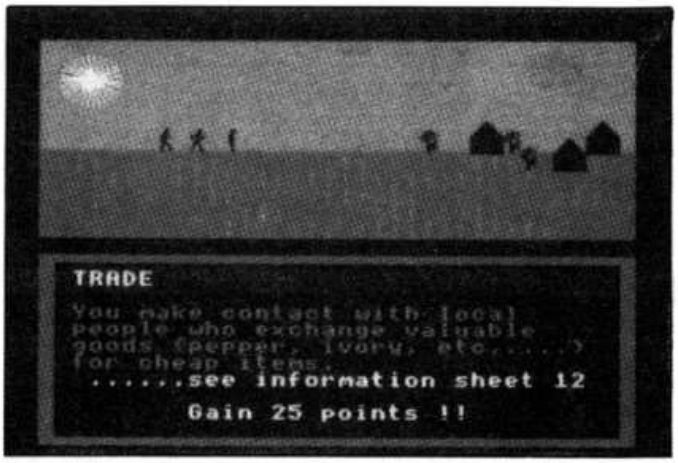
were very much blazing a trail which few have been able to match. They emphasise that their major contribution to the role computers in the classroom is the provision of extensive printed materials to support the programs. By doing this with *Into the Unknown*, they have provided preparatory information beforehand, explanation during the voyage, and extensive follow up work which involves children in a simulated voyage of discovery during the great age of exploration in the 15th Century.

The board game which is, incidentally, still available, has been replaced by three programs. The first, *Preparations*, introduces the youngsters to the 15th century world, and helps prepare them for their voyage such as help them choose the type of ship they will sail in; the navigation using the points of the compass and grid references; reading travellers' tales, which combine accurate observations with fanciful ideas; supplying the ship for the voyage etc.

Many of the screens refer the pupils to the superbly produced information sheets. The brighter youngsters will find the computer program undemanding by comparison, but the less able, (for whom the reading level of the sheets is somewhat difficult), will find them very useful. As they work through *Preparations*, they are rewarded with points used in the main program to represent their ship, crew and supplies at the start of the voyage.

During the programs, the teacher acts as the sponsor and decides whether preparations have been sufficiently thorough for the voyage to begin and, when completed, collects the information that has been gathered by the explorers. Assuming all preparatory work is satisfactory, they can begin their voyage! They are offered two options: exploring the coast of Africa or South America.

The aims of the simulation are for the pupils to complete a voyage in which they chart unknown seas and attempt to find (and map) new lands and sources of wealth. The ultimate goal is to return home with the


TRADE
You make contact with local people who exchange valuable goods (pepper, ivory, etc.....) for cheap items.
.....see information sheet 12
Gain 25 points !!

ship,crew and cargo intact, which would make their voyage profitable – represented by an increase in their total points.

They begin with an exploration chart, which is blank except for the grid; on the reverse side are clear and concise instructions with a key. Their journey begins from any square on the top line of the grid – this is their home port. Movements are made one square at a time in any direction unless otherwise decided by the program, eg journeys inland can take place only through a port.

The teachers' handbook is full of ideas; background information is supplemental to the information sheets, two approaches for using the programs, there is a short but interesting section on sex bias, which could form an element of the topic with older groups in particular, a comprehensive list of resources, and details of actual routes followed by several well-known explorers which might be used as an alternative approach or as a follow-up. Also included are master charts for the two journeys for use by the teacher, which reveal the unknown lands, and hazards and finds – very helpful and time-saving!

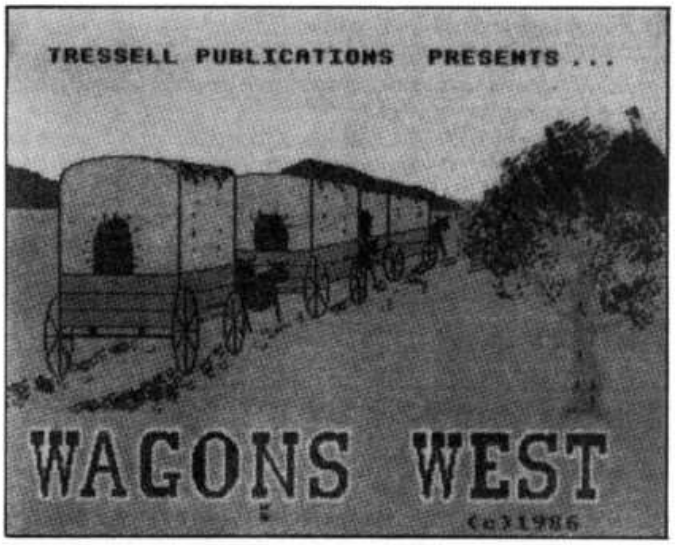
Into the Unknown was designed for use with 10 – 14 year olds. Anyone contemplating the theme of exploration should seriously consider this as an important part of their overall resource. Opportunities for work away from the computer abound – art & craft, creative and factual writing, drama, as do possibilities for discussions on such emotive subjects as slavery, greed and cheating! Much of the support material is more appropriate for older/brighter pupils or background material for the teacher,.so maybe if any of the many teachers of children at the lower end of the age group who have used this program have produced some useful work/information cards, they should approach Tressell. They are, after all, a teachers' co-operative, and might be interested in some supplementary materials!

Wagons West

Wagons West has been designed to assist young people to simulate the experience of travelling west by wagon train as pioneer emigrants in mid 19th century America. The program joins the pioneers' journey across North America at Independence, Missouri, one of the jumping off towns where provisions, oxen and wagons are purchased ready for the long trek westwards. Before the children can begin, individuals must first take on the identity of a member of a group making the journey.

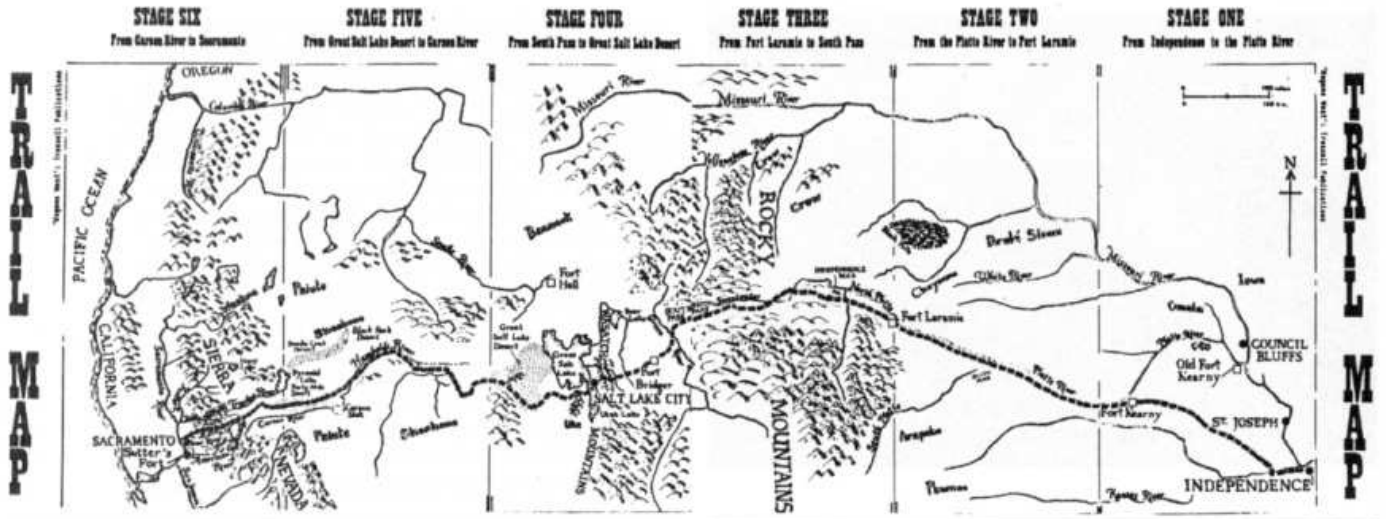
Throughout the trip this character can be developed by the participant, but initially, all information can be obtained from the group cards in the support material – the eight groups take on the names of the towns from which they travelled and this is used as their identity throughout. Then the problems begin: how much supplies should they take with them and what is the best value for money etc All these questions lead to varied and deep discussion within the groups and between groups when the topic is opened up for the whole class to consider. The fact that groups can visit the general stores and see what is available – (the *Fitting Out* program) – and then go away with their record sheets to consider their problems (some useful guidelines on minimum quantities of the various foods are given) before returning to the computer to enter their decisions offers good use of computer time.

The journey across America forces the children



within the group situation to make many decisions on moral issues, on technical matters and on things that can mean life or death. For example, at one stage of the journey the Wagon Train's council decide that they are not making enough time. The solution is that each wagon must lose weight, but what must the children leave behind? Much discussion as to the relative values of the items on board result from this. Incidentally, the ▶

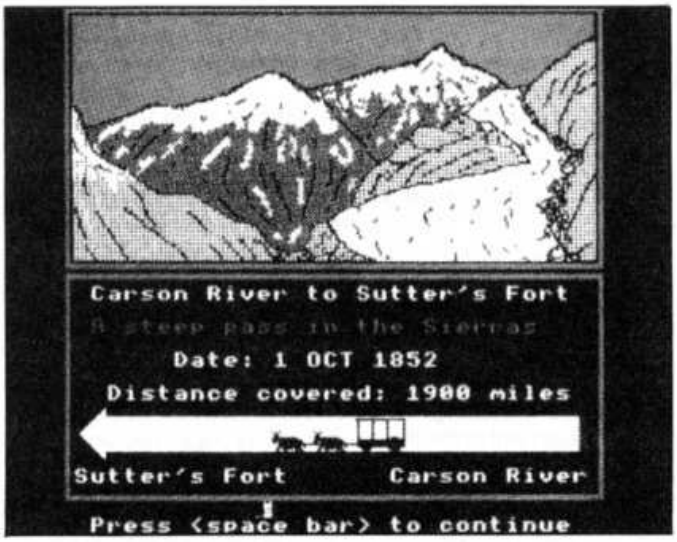
WELCOME TO INDEPENDENCE
Look at the GROUP CARD to see what your group has brought to Independence and what savings you have available to spend on 'fitting out'.
Press (space bar) to continue

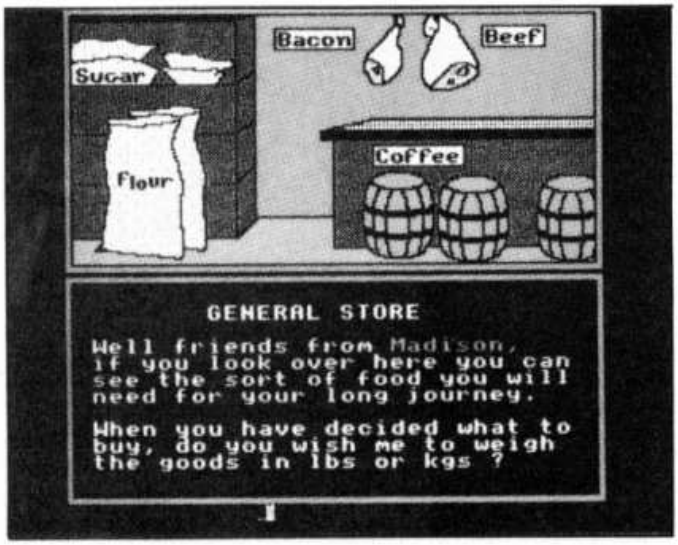


children are told that all wagon trains of this period had a ruling council.

The individual members of the group can choose to serve on this council if they wish with the obvious extension into law and order issues. Another problem on the journey sees the groups come across a supposedly abandoned lady. Should they pick her up and have they enough food? Will they tackle the questions with logic and compassion or selfishness? The group I was with when this problem came up chose after much heart-searching to leave her behind. Later they felt justified as the woman in question turned out to be a thief who had been thrown out of another wagon train – there are random generated alternatives so no two groups are likely to make the same journey.

Problems such as how to cross swollen rivers present themselves. Here the group has to decide whether it is best to wait for the water to go down or turn their wagon into a raft. The latter solution leads quite naturally into a model building approach to solving the problem. There are other problems more relevant to today's society: what, for instance, do you do when children from the group are lost for several days in the mountains; how do you relate to members of other groups particularly when some of that group is suffering from a contagious disease? And, of course, there are the more exciting problems posed by the Indians!




Bacon
Beef
Sugar
Flour
Coffee
GENERAL STORE
Well friends from Madison, if you look over here you can see the sort of food you will need for your long journey.
When you have decided what to buy, do you wish me to weigh the goods in lbs or kgs ?

The journey is divided into six stages and the groups are given the option of stopping at the end of every stage or carrying on – again, particularly helpful in organising use of computer time for the groups. Every stage has four landscape scenes – one at the start, two along the trail and one at the end of the stage – which are simply, but effectively, displayed on the screen and between these there are a total of four events and two decisions. Participants are expected to keep a journey record sheet (provided in the support material) and make use of the trail maps and information sheets. The latter are superbly produced in sepia tones and include copies of many original photographs and drawings and descriptions from first-hand accounts.

Without doubt *Wagons West* could form the basis of a topic for a whole term quite easily. The program itself is very simple to operate and generally speaking if a "wrong" decision is taken it is countermanded by the council, consequently there's every chance of everyone succeeding (eventually), and a relatively quick run through for the teacher is possible. There are numerous outlets into art and craft, logic and problem solving, mathematics, history and geography and all aspects of language – drama, record keeping, diaries and creative writing. The pack will be an asset to any school's resources as it puts the children into real life situations where they have to think for themselves and others as they go on an exciting journey. It makes excellent use of the computer – how else could one take a class back to 1852 and ask them to journey across America in a covered wagon so successfully?

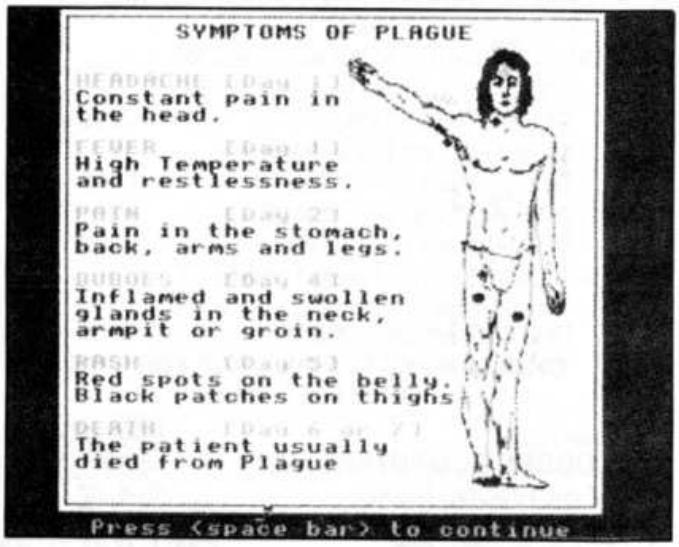
1665: The Great Plague of London

This package aims to give you an idea of what it was like to face a major outbreak of plague in 17th century London. It attempts to do this by placing you in 17th century London, and giving you the opportunity to deal with the problem of disease and public health as if you were an important person living in the year 1665. In other words, you will be required to take on the role of a person from the past and then act out a situation from history as if it was real life.

The pack consists of three computer programs: *Introduction*, *Meetings* and *Conclusions*, two copies of their *Contemporary accounts of the Great Plague of London*, five Pupils' User Guides and the Teachers' Notes. The Pupils' Notes make good use of the screen displays, which continue the improvements shown in *Wagons West*, this time making considerable use of digitised pictures. Another interesting feature added to the programs is a facility to print out most screens (any of those that have a "Press the Space bar" or "Press to Select" subscript) to an Epson compatible printer, which can be used to illustrate workcards, notebooks or newspapers. This is achieved by simply pressing f0, so I imagine it should be a fairly simple matter for Tressell to program a few more of the function keys to give halfsize printouts or options for other printers, eg colour. Bearing in mind the amount of contemporary materials Tressell must have available, this opens up interesting possibilities for providing schools with super collections of illustrative materials which can be used in desk-top publishing!

Introduction is divided into four sections: *London in 1665* gives background information on London through maps of the City and surrounding areas. *Disease in London* describes what London was like in 1665 and explains why it was a centre for sickness and disease (giving details of some of the more serious ones), *Symptoms of Disease* lists the most common symptoms of bubonic plague, which helps you to recognise plague when you are asked to identify the illnesses of four patients from the symptoms which are given in sequence; and, lastly, *Remedies for Plague* gives details of the different ideas various groups of people had about plague and what should be done to prevent or cure the disease. I must admit when I first ran this *Introduction* program I wondered whether it could have been presented just as well in booklet format, because there are only a small number of occasions when any interaction – other than pressing <Space> – is required. Whether you like it or not, group dynamics appear to be achieved far more easily around a monitor than with heads stuck in books, and it is certainly well presented!

What Really Caused The Plague
Rat fleas live in the fur of the black rat.
The rat flea feeds on the blood of an infected rat and takes in the germ.
Press <space bar> to continue


SYMPTOMS OF PLAGUE
Constant pain in the head.
High Temperature and restlessness.
Pain in the stomach, back, arms and legs.
Inflamed and swollen glands in the neck, armpit or groin.
Red spots on the belly. Black patches on thighs
The patient usually died from Plague
Press <space bar> to continue

Meetings simulates an outbreak of plague in London in 1665. Each group acts as a public health committee for a particular area of London. The group can select the area it wishes to represent, and individuals choose from a list the person they would like to play. The first committee meets in May 1665 and monthly thereafter. Providing the group notes its code numbers, it is possible for them to go away from the computer at the end of each month's meeting and return when ready to continue.

The computer program gives the "bones!" of the information required by the committee – the news in the form of newspapers, the public records (bills of mortality, burial registers, and plague reports) – and at each monthly meeting a health problem are displayed with three options or choices of action and the pupils' user guide gives further tasks/questions for the groups. Some of these are quite testing – I must admit in the case of the screen options.

One of the main aims of this program appears to stimulate discussion among pupils of secondary school age. Here I'm thinking about the availability of the ▶

computer and good discussion shouldn't be controlled by computer time!

The Conclusions is a fairly short program which gives statistics in well-presented graphical form together with illustrated information on what really caused the plague.

Any group of secondary pupils studying the concepts of cause and effect will find that this program offers them an interesting example. It also gives opportunities to empathise with people involved in similar events in the world today, eg famine, and to consider and practice the many advanced skills required in committee work. Tressell emphasise that the computer and computer programs are but one resource among many – albeit an excellent and motivational one. 1665 offers an interesting variation on the theme and many opportunities for the dramatisation of the events!

Conclusions

The fact that Tressell are free of many of the restrictions imposed on commercial publishers under the name of profitability is evident in all their computer assisted learning packages – to date they have produced only four, ie one a year. The volume of the support material and the price they charge for their packs must frighten the pants off many of their competitors – it is little wonder that few of the big names in book publishing who jumped on the band wagon in the hope and expectation of making a quick buck at the start of the computer "boom" in education remain. The quality of their material and the care and attention given to detail, eg the tremendous photographs included in the *Wild West* Information Sheets, is indicative of a vast amount of time spent on researching the topics.

If I were to have one criticism of their support material – and it's a point they recognise themselves (in "Curriculum Development in Action") in relation to their first package – it is that the reading level is fairly high. That, in itself is not a bad thing, but at this level of support perhaps more thought might have been given to providing some material for the younger or less able pupils. The fact that the screen displays in the last two packs have improved out of all recognition, is perhaps just indicative of the long way educational programs have come in a relatively short time. Understandably, in view of the background to the co-operative, their programs to-date have been aimed at the middle and secondary school age range. I understand that before long we can hope to see something for the younger age groups!

Factfile

- **Into the Unknown** costs £31.50 inc VAT
- **Wagons West** and **Attack on the Somme** cost £20.00 inc VAT
- All the above and **1665: The Great Plague of London** are available from *Tressell Publications, Lower Ground Floor, 70, Grand Parade, Brighton, East Sussex BN2 2JA* ☎ (0273) 600186.

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HOME OFFICE

H O M E O F F I C E
GENIE DESK DIARY - Week Planner
Monday 13 Jun 1988
Tuesday 14 Jun 1988
Working breakfast at Savoy
Morning off to take car for service
Meeting with chairman 3p
Marketing update 2pm
Wednesday 15 Jun 1988
Thursday 16 Jun 1988
Dentist's appointment 9am
Secretary on holiday

Genie Utilities

Having been very favourably impressed with Genie early this year, I was happy to pick up a copy of *Genie Utilities* from *Permanent Memory Systems* at a recent show. The disc is provided in a format suitable for 40 or 80 drives, DFS and ADFS. The straightforward manual is a further advert for the qualities of PMS' NTQ fonts and the text clearly explains the utilities available for the address book, notepad, diary and phonebook.

The most useful from my point of view turned out to be the diary print and spool utilities. A very neatly formatted set of entries can be printed or spooled for use in a wordprocessor.

Week planner

Especially nice is the week planner, which lays out all the diary entries for a particular week together with a calendar for the relevant month onto an A4 sheet. *And*, if your *home office* didn't get a diary for Christmas you can print out a calendar for any month this century!

Priority telephone numbers in the phonebook can be printed or spooled for use elsewhere eg a text file containing numbers for an autodialling modem. Notepad pages can be printed or spooled after selection by page number or keyword. The same goes for addresses. There is also an 'in range' option for the address book where names alphabetically within two specified strings are used for spooling or printout.

An import program helps the process of taking data from other databases or wordprocessor lists into Genie. I found this quite an easy task and was very grateful for its inclusion.

Permanent Memory Systems are asking a sensible price for an excellent addition to the original Genie. If you were hooked first time around then I suggest an add-on for '88.

Spell Master utilities

In the August 1986 Plus Talk, I discussed at some length the delights of Computer Concepts' Spell-Master ROM and provided illustrative examples of Wordwise Plus and BASIC programs making use of the ROM. I have since discovered that Norwich Computer Services - producers of Word-Ex and many other books and support packages for Wordwise Plus owners - are offering a set of *free* programs and files to go with Spell-Master when purchased from them. Having requested sight of the disc, I must say that I was very impressed with their offering and consider it a significant reason for purchasing the ROM from them as opposed to another supplier. I will give a brief account of what you get. Some of these facilities are restricted to Wordwise Plus owners, but others can be used by anyone.

Some of their offerings support players of word games such as Scrabble. This game, of course, requires use of a dictionary in order to check whether player's words are legal or not. Keen players develop a vocabulary of relatively short but incredibly obscure words many of which are absent from the dictionaries supplied by Computer Concepts.

Norwich supply you with a supplementary dictionary of over 1500 such words in both sideways RAM and text file format. In addition since Scrabble permits two letter words which are not stored by Spell Master, Norwich have provided a file of such words and a Wordwise Plus segment program to check whether your offering is legal.

Computer Concepts have already spoilt the fun of crossword puzzling for me by their inclusion of *CROSSWORD and *ANAGRAM in the Spell-Master ROM making cheating absurdly easy! Players of the Daily Express 'Target' word puzzle can now substitute Norwich's ANAWORD program for their own intelligence and get on with the gardening instead. This is a BASIC program which will find all words that can be made up from subsets of a long list of letters by repeated use of the *ANAGRAM facility. You have options to specify letters which the word must and may contain. The only snag is that there are many possible combinations of a sizable letter string to consider so that processing time may be extremely slow. According to the documentation supplied, the program will find 822 words that can be made from the letters of the word 'righteousness' but takes 48 hours to do it! Incidentally, the documentation includes an apology for the use of 79 GOTOs in 300 lines of code. Those who followed my discussion of the simple BASIC program presented in my earlier article should understand why this was necessary.

One of the most practical programs on the disc is another Wordwise Plus segment program called CATCHIT. This allows you to enter any of the Spell-Master * commands that search for words (eg *CHECK, *CROSSWORD, *ANAGRAM) and output the resulting list into the main text area of Wordwise Plus for any further use you may wish to make of them. This is considerably more useful than simply dumping them to screen or printer as with the supplied ROM. The final program on the disc is somewhat obscure, requiring two Wordwise Plus BBCs linked together in order to avoid duplicate outputs from *ANAGRAM! In general, though, this disc provides considerable incentive for buying your ROM from Norwich Computer Services (18, Mile End Road, Norwich NR4 7QY, telephone 0603-507057).

Mary Branscombe

TWICE BITTEN

A hellishly good modem from Demon

The Demon modem has had a long and turbulent career as one of the Beeb's most successful modems on the market. Appearing some two years ago, the company who initially released it as the "Unicomm" modem, had to rename it to the Demon because there was already a Unicomm modem about!

After going into liquidation, the Demon modem was rescued and sold off to Dataphone Ltd, and the Demon modem settled down to impressive – albeit low key sales.

But Dataphone are back! With a new modem, a new image, but still the same old software "with the last of the known bugs taken out".

The *new* Zromm

For those of you who have never seen the old Demon modem, or its accompanying software, then you must have probably been living as a monk in outer mongolia (something tells me I am going to regret saying that), the software – called the Demon Zromm , has been hailed as possibly the most incompatible piece of Beeb software ever written – it used to crash out in View, it used to make most computer games inoperable, and it used to refuse to work properly with shadow RAM.

But Dataphone have put that all behind them now. The Demon II ROM is now compatible with all ROM boards, all shadow RAM expansions, the many and varied DFS's (and the ADFS) and yet it still retains compatibility with the older ROM – so programs written using the commands in the Zromm – for instance will work with the new Dataphone ROM.

With the success of the modem in the home, a number of professional services have crossed over from the states, or have simply just cropped up. Gone are the days of university supported computer enthusiast clubs, nowadays computer communications is big business. You can obtain information from computerised databases all over the world, and although sometimes the prices can be quite high (up to $100 per minute), people still want to access and pay for such information.

Gods and Demons

The modem itself is quite small and compact, being about the size of a floppy disc box, it is tastefully coloured in beige with a blue front fascia, it has a single button on the front of the fascia (for power on/off), and at last, all the hardware is controlled by operating system commands in the ROM.

On the Back of the modem is a 25 way "D" Connector. This makes the Demon II an interesting product in that the hardware is now no longer Beeb specific; The D connector is an accepted RS232 standard, so you can now plug the modem into an IBM PC or PS/2 as easily as an Amiga, an Atari ST or even an Archimedes.

The possibility of using this modem with the Archimedes makes this the first modem to be directly "plug in and go" for the Archimedes – software exists for Archie communications, but as yet I haven't seen any software from Dataphone for the Archimedes – but in time, we will no doubt see one!

The software arrives in ROM packaged up with a very slim 13 page, spiral bound manual. This has to be the worst documentation I have seen for a modem (apart from the original Unicomm software) reviewed back in April 1985. The sheets are photocopies inserted between two clear acetate sheets, and nowhere was there any indication that this was a pre-release document, so I can only assume that this is the real thing.

The Dataphone Zromm originally accompanied the Demon modem, and in its day, it was quite a good piece of software. It enabled users to set up their own databases and bulletin boards, and it had a comprehensive Prestel terminal. However, as memory expansion devices such as 6502 second processors and shadow RAM boards became more and more popular, the Demon Zromm proved incompatible with all of them and soon got left by the wayside and was eventually forgotten.

Connecting the modem is easy; after plugging in the ROM you plug the modem into a wall socket, (no power supply this time) you put the BT connector into the telephone system (you can get inexpensive socket adaptors that double up a single wall outlet) and the RS423 plug goes into the back of the Beeb's RS423 socket, after powering on, you are ready to go!

Obviously the first thing you will be itching to do is get onto a bulletin board, and there are quite a few around, and this is where the first time user is likely to fall into some problems, because bulletin boards often work at a number of different speeds, the most common of which is either 1200/75 or 300/300. What this means is that the modem must send information down the telephone line at certain speeds suitable for the host computer, (that's the computer you have dialled) to pick up, and make some sense of what is coming down the line.

For the host computer to understand your signals, you have to do one of two things: Firstly, you have to manually change the switch at the front of the modem to the speed at which you are sending, and secondly, you have to set the software to do the same. This isn't as complicated as it sounds, for instance, if you wanted to log onto Prestel you would have to do the following:

***BAUD 1 <Return>**
***DIAL 123456789 <Return>**
***PRESTEL <Return>**

And that's it! If you are lucky enough to live in London and some local areas, then simply dialling 618 will get you into the London Prestel computers. The Dataphone ROM supports this in a single command (*PRETZEL), which sets you up, and logs you on.

One of the major features of the Dataphone ROM is its ability to automatically answer any incoming telephone call. This feature is obviously vital if you intend to operate a bulletin board service of your own that can be left running without a human overseeing the whole process. The software picks up the call from the modem by generating an error, so that whenever a call is detected, a system interrupt is used to put the modem on-line and to jump into a section of your bulletin board program that deals with new callers, like a log on page, or a welcome screen.

The command to change baud rates (both incoming and outgoing) is *BAUD. This command can set the BBC (*not* the modem) to various different transmission protocols, for example, *BAUD 1 sets the beeb for 1200/75, whereas *BAUD 2 is used for "reverse Prestel" format which is 75/1200. *BAUD 3 and 4 are used to set 300/300 baud in either originate or answer mode, and although the modem cannot support full duplex 2400, 4800, and 9600 baud, these are supported in software, should you need beeb to beeb communications, interestingly enough, the manual states that the hardware cannot support 1200 duplex, but there is a position on the front panel, set aside for this purpose!

*CARRIER is a command that simply waits for 20 seconds, listening for 2 seconds of continuous carrier tone; if, after 20 seconds there is no carrier to be found then the error message "No Carrier" is given. This is often misleading as very often a bulletin board is broadcasting a carrier signal at one baud rate, whilst you are searching of a carrier at another rate! The modem has only ears for the baud rate it is set at, so you have to be certain what transmission protocols are needed before dialling up.

One of the three terminals built into the Dataphone ROM is *CHAT. This is the simplest of the three and is simply a scrolling terminal, it is *very* basic and has no facilities for frame storage, spooling or printing, it echoes all characters transmitted and received, including control codes which are normally filtered out.

*CHAT is useful when talking to BBC dedicated systems that use the BBC's graphics capabilities to the full; for instance, the host computer can simply change screen modes by sending a VDU 22 signal, and then a number between 0 and 7 to select the desired screen Mode.

By simply selecting one of the three options, you can receive ASCII text files (using the first option), transfer programs and data in the second, and for more sophisticated and reliable error detection, XMODEM is the recommended transfer protocol, as the software has the capability of requesting "bad blocks" of data again should you have a poor telephone line.

When you are reading text transmitted from an online system, it is highly likely that you will need to pause from time to time so that the text doesn't go shooting off the screen before you can read it. The normal way to stop the screen is to press <Ctrl> and < Shift> for spooled files and BASIC program listings, but the trouble with this is that the host computer doesn't know when to stop, so if you keep your finger held down on these keys for too long, you will lose new text being transmitted, which is not an acceptable state of affairs.

Fortunately this loss of data can be prevented using a protocol called XON/XOFF handshaking. This protocol controls the flow of data being received by sending control codes from the user to the host computer, in effect, when your computer cannot receive any more data, the host computer is asked to stop sending data, when the beeb has digested what it can, then it requests some more.

When the *FLOW command is set to "ON", then the Dataphone ROM will be ready to handle the XON/XOFF protocol. I generally leave it set "ON" at all times when talking to most commercial systems and bulletin boards. You tell the host computer to stop sending any more info, by pressing <Ctrl> S, and if the host is set up for XON/XOFF, then it will pause, when you wish to resume, you simply press <Ctrl> Q and the host starts sending again.

The Dataphone ROM takes memory for itself in a number of "underhand" ways, for instance, Dataphone has to preserve the status of certain "flags" and in order to stop any problems associated with clashing workspace, the Dataphone ROM has a *HOPPIT command which "desockets" itself, and makes it invisible to the operating system until a power up or a clear memory operation is made (* FX 200,3 and then <Break>).

An interesting point is that when a *HOPPIT is initialised, *HELP will not produce the Zromm help message, whereas a *ROMS will!

On similar lines is the *NOVEC command. This is a little less drastic than the *HOPPIT command in that it merely disables the interrupt vectors set up by the Dataphone ROM, these are used to perform tasks in the background whilst you are doing something else. With the ROM installed, some operations in other ROMs are a little, ahem, "erratic", and it is likely that you would want to disable certain unwanted features creeping into other ROMs like Commstar's clock whizzing around at an alarming pace, and Pagemaker's "locking up" whenever the cursor is dragged into the icons at the top of the page. By using *NOVEC, these problems (and no doubt many other will be found out in future) can be ironed out.

The Prestel Terminal

The second terminal, and the one I made a bee line to when initially setting up the modem, is the Prestel Viewdata terminal and editor. If the *PRESTEL command is postfixed by a telephone number, the Dataphone ROM will dial the number and also enter your password and any page number you wish to jump to directly after logging on simply by using function key 11.

When you start to dial (or if you have some hand written dialup software), you simply type ***KEY 11"12345678**PSWD ***81052 M"**, and a *PRESTEL (or PRETZEL) will do the rest.

Once in Prestel, or any Prestel lookalike system, you can the use the keyboard as a normal Prestel keypad, with the exception of <Return> which actually sends a hash sign. The "£" pound key is sent as an underline code, whereas the "#" hash key sends a pound sign to Prestel.

Enhanced features include the <Copy> key as a frame redraw (also known as *00#); the <Cursor left> key tells Prestel to jump ▶

back to the previous frame, this can be achieved manually by pressing *#.

One of the most popular facilities provided on Prestel is the ability to send electronic messages to other users and information providers on the system. These messages are called mailboxes and mailboxes are sent on special "response frames". Some of these are available for user to user mailboxing, while the rest are used for such things as reply services to advertisers and information requests.

The most frequently used mailbox frames are found on pages 77#, 88# and 89#, although a directory of literally hundreds of frames can be found on page 7#. To send a mailbox simply type *77# or whatever, and the mailbox number to whom you are sending the message and you get put into the online Prestel mailbox editor.

The mailbox editor allows to you move about the screen and then write text anywhere you want it to be, including double height, flashing and coloured teletext graphics and characters. There isn't an offline editor built into the ROM which is a shame, as the writing of mailboxes can be expensive if you spend a lot of time sending messages. If you are going to take advantage of all of the mailbox facilities, then make sure you get an offline mailbox editor, it needn't be in ROM or anything special like that, but a piece of software that can create suitable pages for uploading as mailboxes would be money well spent.

Whilst in Prestel mode, the function keys have been assigned special meanings, and a keyboard strip is provided. Key <f0> is used to send OS calls to the beeb, whilst still being online. <f2> and <f3> are used to save pages, <f2> saves the frame using the frame number as the filename, so, for instance, a Micronet news headline on frame 8001110# will be saved as "a.8001110", and if this is a multiple page frame, such as a long news story, then subsequent pages with the same number will be saved as "b.8001110".. . "c.08001110"... and so on. You can create subdirectories if you are using the Dataphone ROM with ADFS to make even more meaningful use of this facility.

If you are not yet used to Prestel, and you are unsure as to what lies on what saved page, then you can always use <f3> which saves frames under your own more meaningful filenames. You might find it wise to write some software that displays your saved frames in a "carousel" format, this can be useful as it saves having to *LOAD or *TYPE the pages every time you wish to access information stored on the screen.

<f5> is the standard telesoftware downloader. Telesoftware is stored on the Prestel database in a special format. BBC micro programs are downloaded into main memory; this is a very simple process which is completely managed by the Dataphone ROM, all you have to do is press <f5> when the Prestel screen tells you to do so, and to enter the filename when the downloading is complete, it's as simple as that!

It is an incredibly rewarding feeling to have successfully downloaded a piece of telesoftware, especially if it is a long program . Most telesoftware is free, although some does incur a charge (which is directly credited to your Prestel account charges), but if telesoftware does cost money, you will be informed about it.... now you see why it is important to keep your personal Prestel password and number secret!

Like the other Viewdata and Telesoftware services Ceefax and Oracle, some pages use control codes to hide information. This normally takes the form of answers to quizzes or jokes and competitions, if the screen ever says "press reveal for answer", you press <f6> and all is revealed!

<f7> is the last command key in the Prestel terminal, and this is set aside for printing pages of Prestel information on any parallel printer connected to the beeb. It won't attempt to print the Prestel frame graphics, but it will print page information (at the top) and any words contained in the frame, filtering out the graphics codes to stop any spurious side effects.

The last terminal in the Dataphone ROM is the one most used by bulletin boards, mainframe and university computers, as well as PSS nodes for both national and international computer communications.

"...makes this the first modem to be directly plug in and go..."

Terminal Case

Like the Prestel terminal, *TERMINAL will simply enter the terminal, and postfixing it with a telephone number will dial the number for you, check for the presence of a carrier and if one is received, then it will drop you into the terminal. You can also include a log on sequence – again by programming function key 11 with the *exact* logon sequence, it saves a lot of time connecting to larger mainframes which generally require a more complicated logon sequence.

Probably the most useful option will be the first function key, <f1> sends a disc file down the line to an electronic mail system , so, if you send international messages on PSS (rather like you would send mailboxes on Prestel), then it is best to send ready made files down the line instead of having to type it all there and then. You can use Wordwise generated files, although VIEW and Interword need to be *SPOOLed before their files can be transmitted as they include special control codes which are likely to be misinterpreted.

You can toggle the "split screen mode" which is useful if you are working on a host system which either does not echo keyboard response (which is very unlikely these days, unless you are communicating with an old ICL system), or if you want to keep an eye out on what commands you are typing, perhaps you are wanting to make notes on how to program the function keys in order to set up a logon sequence.

The "split screen" still has the normal 80 column screen to work with, but it is divided by a line which acts as a special window which is used to echo *all* keyboard presses, so you can also see if the computer is receiving any of your control codes, such as <Ctrl> C to break back to a root directory in RSTS/E and TOPS 10 or <Ctrl> L to clear the terminal screen.

Using Demon II

The Dataphone modem is delightfully simple to set up, the hardware is nice and straightforward, and the software is very easy to get on with. I have used the Dataphone modem quite a bit over the past month, and not once has it ever failed to log me on properly, and even though the software was once a little unruly in its previous incarnation as the Demon Zromm, it has – more or less – been completely rewritten, and has, as a result, matured into a comprehensive communications ROM with a lot to offer – even if the ROM is based on code that is nearly four years old!

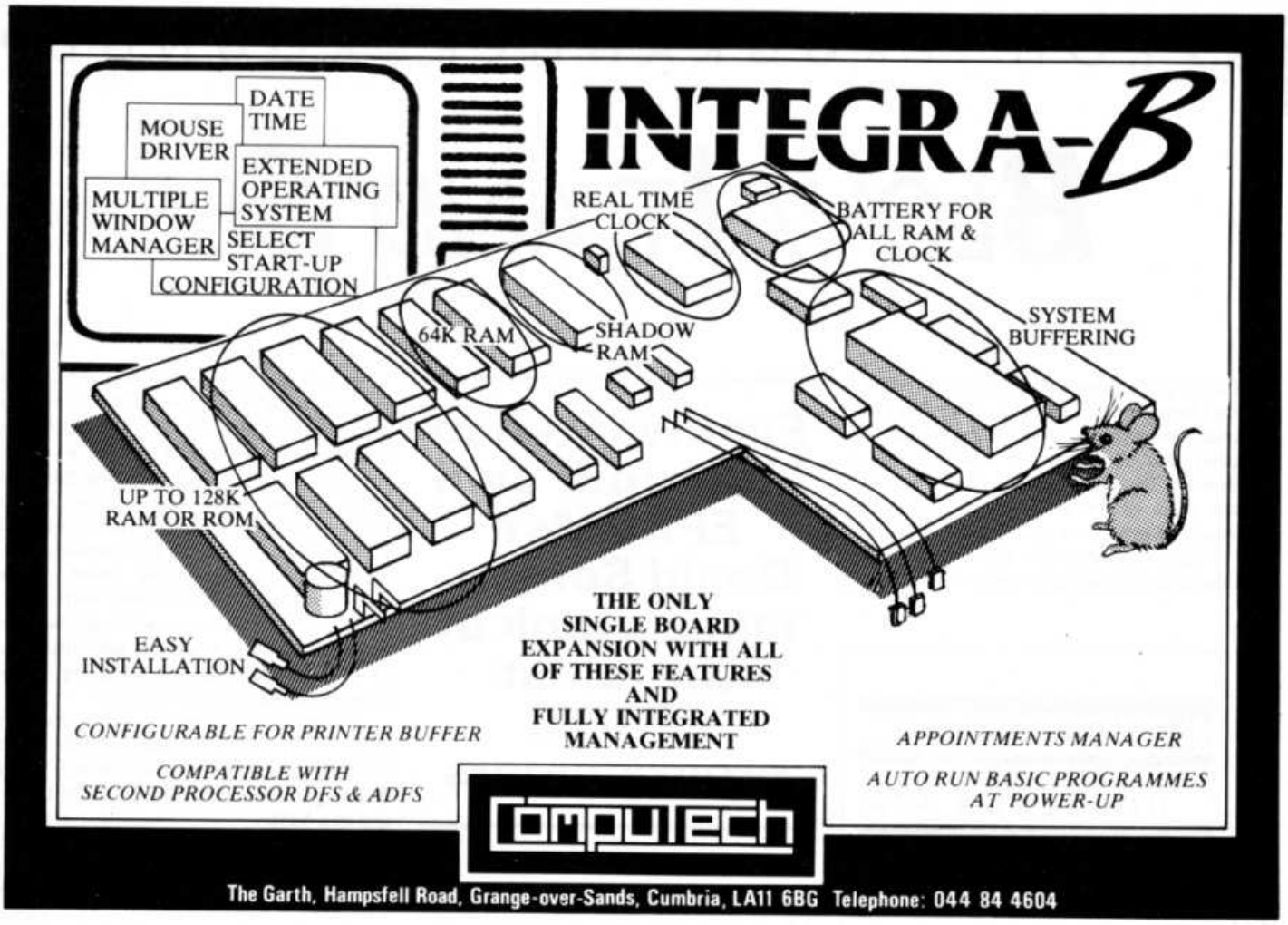
If you are thinking about starting up a bulletin board, then have a look at the Dataphone modem, but you will need to be able to program it properly before you can access all of the answer modes. Programming auto answer and auto dial software is very simple, certainly within the scope of BASIC, and I have successfully written a dialup ROM written in Accelerated BASIC. Some useful examples have been included in the manual, and forms the basis for some very powerful sysop (system operator) facilities.

I would say that Watford's Le modem still has a little more to offer as far as friendliness, and ease of use, but the Dataphone modem, is a very good investment if you are looking for quality, with software that will make it perform as well as many bulletin boards around today. and as a good Prestel terminal.

The Demon II modem is manufactured to equally high standards when compared with Le Modem. But, if you are interested in setting up your own bulletin board, then I would not hesitate in recommending the Dataphone modem for its comprehensive software. It is **not** BT approved modem, (at least the review sample wasn't), but all in all, the Demon II is a very good choice.

Factfile

● **The Demon II modem, 16K EPROM and 13 page spiral bound manual is available from, *Dataphone Ltd, 22 Alfric Square, Woodston, Peterborough, PE2 0JP.* ☎ (0733) 230 240**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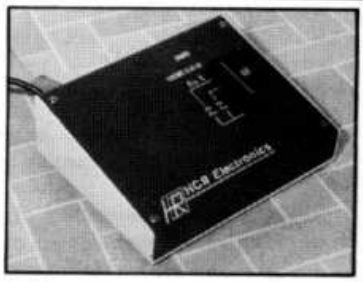

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- ★ Continuous display of option selected.
- ★ ZIF socket powered down when not in operation.
- ★ Mains derived self contained power supply.
- ★ VCC is raised to 6V during programming in line with manufacturers' recommendations.

SOFTWARE ON ROM INCLUDES

- ★ Fully menu driven.
- ★ Automatic verification on completion of programming and fault listing.
- ★ Built in full screen memory editor (buffer is 32K long).
- ★ Software allows blank check or EPROM and automatically lists faults.
- ★ Will copy EPROMS to buffer or file.
- ★ Will generate checksum.
- ★ BBC format ROM images may be created using a number of images of basic or machine code programs.
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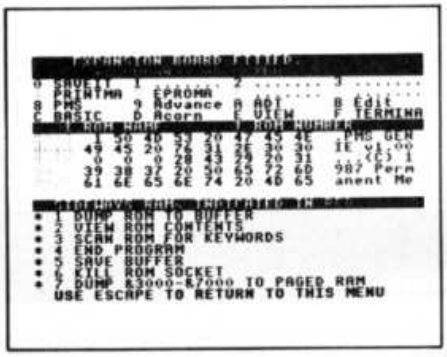
Dave Somers

BLOW IT AND SEE

Ever wanted to blow your own EPROMs? David Somers takes a look at the latest EPROM programmers

Eprom programmers have been around for the Beeb for many years, but they have usually been lacking in sophistication and only being able to program a limited range of devices. The programmers in this roundup are some of the latest around and there should be one to suit your needs.

Table One shows in detail the facilities offered by the various programmers.


0 SAVE11 1 2 3
PRINTMM EPROMM
8 PMS 9 Advance A AUI B Edit
C BASIC D Acorn E VIEW F TERMINA
1 50 4D 53 20 47 45 4E PMS GEN
49 45 20 76 31 2E 30 30 IE v1.00
0 0 0 28 43 29 20 31 ...(C) 1
39 38 37 20 50 65 72 6D 987 Perm
61 6E 65 6E 74 20 4D 65 anent Me
* 1 DUMP ROM TO BUFFER
* 2 VIEW ROM CONTENTS
* 3 SCAN ROM FOR KEYWORDS
* 4 END PROGRAM
* 5 SAVE BUFFER
* 6 KILL ROM SOCKET
* 7 DUMP &3000-&7000 TO PAGED RAM
USE ESCAPE TO RETURN TO THIS MENU

Micron 64

The Micron 64 EPROM programmer is available from HCR Electronic Services and costs £68.00+VAT.

The programmer consists of a two-tone beige slope-front metallic case, of dimensions 2½ by 6½ by 5½ inches. The slope-front of the case houses a Harwin ZIF (Zero Insertion Force) socket. Just above this are two LEDs (Light Emitting Diodes) to indicate firstly that the unit is successfully powered, and secondly that the ZIF socket is active (ie the EPROM is either being *read* from or *written* to).

It is powered by an in-built PSU (Power Supply Unit) which connects by a 58 inch cable to the mains (and you have to supply your own plug). A 30 inch data cable connects the programmer to the computer's 1 MHz bus. No through connector was supplied, so if you wish to daisy-chain other peripherals onto the bus you will require a suitable adaptor (see *"New Horizons", A&B July 1987, pp 34-35*).

Apparently the programmer will also work in conjunction with the Opus Challenger (which normally upsets any other peripherals connected to the 1 MHz bus).

The software to control the programmer is in the form of an EPROM, and this is installed into your computer in the normal manner. Alternatively, it could be saved to disc, and subsequently loaded up into sideways RAM.

To use the programmer, the software is called up using the command *EPROM. This then presents you with a list of EPROMs that the programmer can cater for, asking you for the type required. Once selected, the main menu appears. The top of the screen provides details of the currently selected EPROM type, its size, the programming voltage, and the programming speed. These parameters default to "sensible" settings for the chosen EPROM type, although they can be easily changed to suit the particular type of EPROM that you are using, eg a low programming voltage CMOS type.

There are all the usual options at the main menu: copy ROM to buffer, blank check ROM, program ROM from buffer, verify ROM against buffer, edit buffer, load buffer, and save buffer.

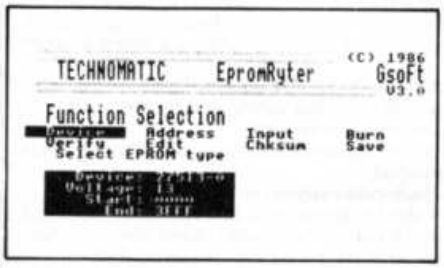
Table One: Facilities offered by the programmers

Programmer	Micron 64	Morley Programmer	Multiprom	EpromRyter
Supplier	HCR Electronics	Morley Electronics	Ground Control	Technomatic
Price	£68+£10.20VAT+£2pp	£34.50+£2pp	£44.95	£119+£2.50pp+VAT
Dimensions (HxWxD)	2.5"x6.5"x5.5"	1.5"x3.5"x5.5"	1.5"x5"x3.5"	3"x7"x5"
Casing	Metal	Plastic	Metal	Plastic
Software on	EPROM	EPROM/Disc	EPROM (£5)	Disc for SWRAM
Socket Type	ZIF Harwin	ZIF Harwin	ZIF Textool	ZIF Textool
Connects To	1 MHz Bus	User Port	User Port	1 MHz Bus
Cable length	30"	17"	18"	16"
Power derived from	In-built PSU	User Port	User Port	In-built PSU
Power cable length	58"	n/a	n/a	53"
PSU On/Off switch	No	n/a	n/a	Yes
Status LEDs:				
PSU OK	Yes	No	) Yes	Yes
Read EPROM	) Yes	No	) Yes	No
Write EPROM	) Yes	No	Yes	No
EPROMs Supported:				
2516 (2048x8)	Yes	No	No	Yes
2532 (4096x8)	Yes	No	No	Yes
2564 (8192x8)	Yes	No	No	Yes
2716 (2048x8)	Yes	No	No	Yes
2732 (4096x8)	Yes	No	Yes (see text)	Yes
2764 (8192x8)	Yes	Yes	Yes	Yes
27128 (16,384x8)	Yes	Yes	Yes	Yes
27256 (32,768x8)	Yes	Yes	Yes	Yes
27512 (65,536x8)	Yes	No	Yes	Yes
27513 (4x16,384x8)	Yes	No	Yes	Yes
27011 (8x16,384x8)	No (tbi)	No	Yes	Yes
EPROM Selection by	Software	Software	Hardware	Software
EPROM Vpp:				
12.5v	Yes	Yes	Yes	Yes
21.0v	Yes	Yes	Yes	Yes
25.0v	Yes	No	No	Yes
Prog. Algorithm:				
Normal	Yes	Yes	Yes	Yes
Fast	Yes	Yes	Yes	Yes
Pulse	No	No	No	Yes
Part Programming	No (tbi)	No	No	Yes

The other option from the menu is the 'Create BBC ROM image' facility which enables programs to be formatted so that they can be programmed into an EPROM, and then executed with a simple * command of your own choosing.

Interestingly, the programmer contains 16 Kbytes of on board RAM for use as a buffer. This coupled with the memory in the Beeb means that 32K EPROMs can be blown in a single pass.

The Micron 64 is a good little EPROM programmer that is capable of programming a multitude of EPROMs. The software was easy to use, and required little reference to the instruction manual. HCR are planning to modify the software to enable 27011 EPROMs to be programmed, and for part programming to be achieved.



EpromRyter

The EpromRyter (or Eprommer III) is available from Technomatic Ltd and costs £119.00+VAT.

It consists of a black plastic slope-front case measuring 3 by 7 by 6 inches. The slope-front houses a Textool ZIF socket. The unit is powered by an in-built mains PSU which connects to the supply by a 53 inch cable (with a moulded plug). A switch on the front is used to turn it on or off, with a nearby LED to provide a visual indication if it's on.

The programmer is controlled by connecting it to the 1 MHz bus via a 16" data cable. Again, like the above Micron 64 programmer, no through connector to daisy-chain other peripheral on to the bus was provided.

As the programmer was designed specifically for the Master series of microcomputers, the software to control it comes in the form of a ROM image on disc for loading into sideways RAM. This can, needless to say, be blown into an EPROM if you require.

From the main menu there are various options leading off to further sub-menus. There are all the usual options to select the device, copy ROM to buffer, program ROM from buffer, verify ROM against buffer, load/save buffer, edit buffer, and blank check ROM.

The buffer editing facilities provided are most comprehensive with block move, fill, and print options.

Once the EPROM type has been selected the programming range can be entered. This allows for partial programming to be achieved and can range from a single byte to the capacity of the device. Interestingly, the programmer can cope with devices that can be identified by reading them, and act accordingly.

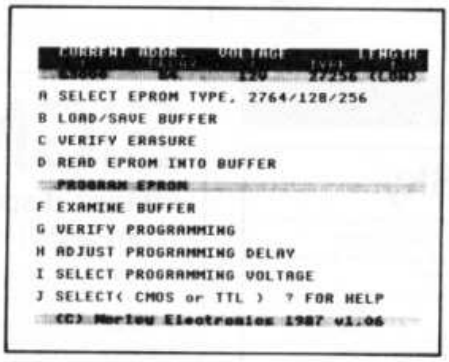
A whole series of sub-menus allow the input device to be selected. If the serial (or RS423) port was selected, you are asked to select the desired baud rate and data format for reading. Then, the data will be read in and can be in either Intel Hex or Motrola 'S' formats. This will be most useful for those developing software on other computers (usually a PC) who can then transfer the data through the serial port for programming into an EPROM.

Although the programmer has many useful facilities and is extremely easy to use, its price is disconerting (especially when compared to the above Micron 64 which offers more or less the same basic facilities). The provision of an LED to indicate if the ZIF socket was 'live' would be most useful.

Morley Eprom Programmer v2

The Morley Eprom Programmer v2 is available from Morley Electronics.

It consists of a rather unassuming plastic case measuring 1½ by 3½ by 5½ inches. The top houses a Harwin ZIF socket, while a 17 inch data cable emerges from one of the sides for connection to the User Port.


A SELECT EPROM TYPE, 2764/128/256
B LOAD/SAVE BUFFER
C VERIFY ERASURE
D READ EPROM INTO BUFFER
PROGRAM EPROM
F EXAMINE BUFFER
G VERIFY PROGRAMMING
H ADJUST PROGRAMMING DELAY
I SELECT PROGRAMMING VOLTAGE
J SELECT(CMOS or TTL) ? FOR HELP
(C) Morley Electronics 1987 v1.06

It is powered completely by the User Port and there are (unfortunately) no LEDs on the unit to indicate if it's successfully powered, nor are there any to indicate when the EPROM is being programmed or read.

Software to control the programmer comes either on disc or on an EPROM.

Once the software is entered you are in a menu selection routine to choose what you want to do. There are all the usual options of selecting the device, loading/saving the buffer, blank EPROM check, reading EPROM into buffer, programming the EPROM, editing the buffer, verifying EPROM again the buffer, choosing the programming speed and voltage.

Pressing the ESCAPE key will cause a secondary program to be loaded. This offers facilities for transferring ROM images into the buffer prior to programming, examining a ROM's contents, scanning through a ROM for keywords, saving the buffer, killing (or unplugging) a ROM, or transferring the buffer into sideways RAM.

Although the programmer is limited in that it can only program three types of devices ,ie 2764, 27128, or 27256, it is most useful as these are the commonest devices used in the BBC microcomputers. It's a good low cost programmer that does its job and works satisfactorily.

Multiprom

The Multiprom EPROM programmer is available from Ground Control and costs £44.95.

It consists of slope-front beige metal case of dimensions 1½ by 5 by 3½ inches. The slope-front houses a Textool ZIF socket, two slide-type power switches, and eight slide-type Dual In Position (DIP) switches. A 19 inch cable connects the programmer to the Beeb's User Port (from where it also derives its power).

Software to control the programmer (UVP 1.1) comes in the form of an EPROM at an *additional* cost of £5.00.

To achieve a programmer capable of programming a variety of devices at such a low cost a few shortcuts have been taken. In operation the programmer is entirely "manually" controlled.

On the front panel are two slide-type switches with accompanying LEDs that are used to power the programmer and the EPROM in its ZIF socket (Vcc), and the other to supply the programming voltage to the EPROM (Vpp).

An additional eight slide-type DIP switches are used to configure the programmer for the EPROM type to be programmed. The EPROMs that it can program are shown in Table One. Note: to program 2732 devices it is necessary to construct a small carrier board to place the EPROM, in which is then placed in the ZIF socket.

A whole host of star commands are provided in the UVP 1.1 ROM for using the Multiprom. Due to the way that the programmer has been designed, EPROMs are programmed in "blocks" of 16 KBytes at a time. The commands available are blank test EPROM, transfer the contents of the EPROM to memory buffer and save to current filing system, examine the memory buffer, program the EPROM, and compare the EPROM with a file.

Although the programmer performed well, the fact that it is manually controlled makes it fiddly to use and hard to recommend. If the device selection DIP switches are wrongly set my mistake you could zap your EPROM.

Factfile

The above products are available from:

- **HCR Electronic Services, HCR House, Bakers Lane, Ingatestone, Essex, CM4 OBZ. Telephone 0277-355407.**
- **Morley Electronics, Unit 3, Maurice Road Industrial Estate, Wallsend, Tyne and Wear, NE28 6BY. Telephone 091-262 7507.**
- **Ground Control, 4 Alfreda Avenue, Hullbridge, Hockley, Essex, SS5 6LT. Telephone 0702-230324.**
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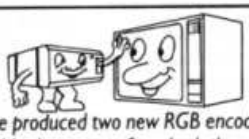

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You are Bono, a friendly dragon residing in a picturesque sea-castle. As a shrewd business-dragon, keen on "nice little earners", you make your living by selling soap to the giant monsters who bathe in the sea surrounding the castle.

With the aid of your business partner, named Fozzy, you produce the soap by collecting skeletons amongst the castle caverns and then boiling the bones in a cauldron.

However, the castle caverns are fraught with danger: there are monsters who will kill you, spiders who will eat you alive, and glooks who will block your path. It will pay you dividends to also avoid the perilous trapdoors and hidden volcanoes.

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